

# chapter 1

## Visions Past and Future

Our vision of transportation in this new century and this new millennium is shaped by the many successes of our past and a renewed commitment not only to meet but to surpass new goals, as we strive to obtain transportation excellence for all Americans. Today, under the leadership of President William J. Clinton and Vice President Al Gore, transportation has moved from strength to strength, and the U.S. Department of Transportation (USDOT) is poised to lead the transportation enterprise as we improve safety, expand mobility, support economic growth and trade, protect our environment, and support America's national security interests.

A quarter century ago, William T. Coleman, Jr., the fourth Secretary of Transportation, opened a window into the lives of Americans that was extraordinary. He painted a picture of our society, of the ways in which we travel and interact, of our economic lives, of our safety and health, of our environment, and of our use of natural resources. And then he went even further. He used the knowledge of the past to look into the future, and he set about creating a planning and decisionmaking framework to guide that future. Over the next two-and-a-half decades, the document that outlined that framework would fade from view. But, remarkably, the future unfolded in many ways just as Secretary Coleman envisioned in the 1977 report, *National Transportation Trends and Choices* [USDOT 1977].

Eight USDOT Secretaries would stand watch as the future became reality. They challenged the Department and the transportation community to implement a new vision for transportation in the United States—to embrace higher safety goals, to champion deregulation and investment efforts, to pursue greater private-sector participation in meeting our transportation needs, and to adopt policies that enhanced the performance of the nation's transportation system. Among the Secretaries, Secretary Neil E. Goldschmidt continued efforts to deregulate the railroad and trucking industries as the Staggers Rail Act of 1980 and the Motor Carrier Act of 1980 became law. Secretary Samuel K. Skinner oversaw the passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), a major surface transportation program, which also led to the establishment of the Bureau of Transportation Statistics (BTS) during Secretary Andrew H. Card's administration in 1992. And Secretary Federico F. Peña successfully worked with the transportation community to implement the provisions of ISTEA.

Today, Rodney E. Slater, our thirteenth Secretary of Transportation, has changed the face of transportation through visionary and vigilant leadership and by setting aggressive goals that will make our transportation system progressively safer and more sustainable in the face of

*"If we make wise and informed choices today and in the years to come, we can make our communities more livable, give our citizens greater choice and mobility, protect our environment, and help create a truly global community. The 20<sup>th</sup> century was indeed a golden age for transportation; the 21<sup>st</sup> century can be an even brighter one."*

William J. Clinton  
President of the United States  
May 15, 2000

change. Secretary Slater challenged us to expand our horizon by pursuing a transportation system that is more than just a physical infrastructure of concrete, asphalt, and steel; and in turn, he redefined transportation to be about people and their total quality of life. Through transportation, he created opportunities for us all to lead safer and more fulfilling lives. During his administration, several laws governing major transportation programs were reauthorized. These include the Ocean Shipping Reform Act of 1998 (OSRA), the Transportation Equity Act for the 21<sup>st</sup> Century of 1998 (TEA-21), the Coast Guard Authorization Act of 1998, which established the Marine Transportation System (MTS) initiative, and the Aviation Investment and Reform Act for the 21<sup>st</sup> Century (AIR-21). Also, during Secretary Slater's tenure, 38 new "open skies" agreements were signed with countries around the world, bringing today's total number of these liberalized aviation agreements to 52.

*The Changing Face of Transportation*, together with its companion document, *Transportation Decision Making: Policy Architecture for the 21<sup>st</sup> Century*, links past and present and then points us toward future successes. Both documents reflect the Department's determination to fulfill its Strategic Plan, its resolve to remain visionary and vigilant, and its intent to lead the way to transportation excellence in the 21<sup>st</sup> Century.

Under the collaborative and open leadership of Secretary Slater, today's transportation enterprise is leading America's great transition into the global economy. Today's decisionmakers persist in ensuring that our transportation system remains *international* in reach—linking us to new markets and destinations around the world; *intermodal* in form—gaining from the combined strengths of the individual modes; *intelligent* in character—harnessing the tremendous power of technological advancement to expand our capabilities; and *inclusive* in service—moving always forward and leaving no one behind. Our transportation system must also be *innovative* in scope—deriving every benefit from technology that enhances safety and makes our communities more livable.

Under the leadership of the Clinton-Gore Administration, we have made safety our top transportation priority. But today's USDOT is positioned to do much more; we must make the system even safer, we must improve mobility and accessibility, and we must protect our environment, while supporting our national security goals.

#### Box 1-1

##### **Purposes of *The Changing Face of Transportation* and *Transportation Decision Making: Policy Architecture for the 21<sup>st</sup> Century*, 2000 :**

1. Present a blueprint to build a transportation system that goes far beyond the goal of safely and efficiently moving people and goods to one that improves our total quality of life.
2. Provide a vision to inform future decisionmakers and policymakers for the 21<sup>st</sup> Century—a vision that puts people first and strives to leave no one behind.
3. Show that aggressive "stretch" goals can be achieved through collaborative leadership that brings partners together to produce maximum results.
4. Estimate and illustrate the potential results of current policies.
5. Show the potential improvements from achieving the Department's Strategic Goals.
6. Illustrate record-level infrastructure investment that significantly improves the condition and performance of our nation's transportation system.
7. Forecast and show the impacts of policies on public safety, energy use, environmental enhancements, and technological advances.
8. Show the emerging trends in transportation demand and their potential impacts.
9. Encourage an informed decision-making process that draws on the best from all stakeholders at federal, state, and local levels, and from the private sector.
10. Facilitate a transportation system that is truly the "tie that binds" us together as a nation and connects us to the rest of the world.

**The Purposes of *Trends and Choices*, 1977:**

1. Estimate and illustrate the potential consequences of policies.
2. Show that long-range consequences are considered in both substantive and resource allocation decisions.
3. Encourage a view of transportation as a means to broader national goals.
4. Promote a more informed public debate on transportation decisions.
5. Forecast and illustrate the impacts of policies on energy conservation, environmental enhancement, assistance to the transportation disadvantaged, and public safety.
6. Indicate the directions in which current and future transportation policies are taking us.
7. Initiate a planning process based on common time horizons and planning assumptions.
8. Encourage transportation performance measurement.
9. Facilitate federal decisionmaking with information on desired or probable directions.
10. Encourage careful evaluation of proposed regulatory actions.

## Goals of *The Changing Face of Transportation*

*The Changing Face of Transportation* provides a historical perspective for policymaking. It reviews the major policy milestones of the past quarter century and the social and economic context for those milestones. Secretary Slater provides a logical foundation for making future policy choices and challenges the transportation enterprise to aspire toward higher marks of excellence, moving beyond what we think is possible and also thinking globally. Some future policy choices are apparent already and, as with the choices envisioned by former Secretaries of Transportation, undoubtedly many more will emerge as the future unfolds.

Today, we can look forward with confidence knowing that our transportation system reflects the remarkable achievements of the Clinton-Gore Administration in striving to meet our nation's transportation needs. Under their leadership, virtually every law governing major transportation programs has been renewed, including the Trucking Industry Deregulation Act of 1994, the Ocean Shipping Reform Act of 1998, the Transportation Equity Act for the 21<sup>st</sup> Century of 1998 (TEA-21), and the Aviation Investment and Reform Act for the 21<sup>st</sup> Century (AIR-21). These Acts provided record-level infrastructure investments, increased funding flexibility, expanded the proven strategies of public participation in the planning process, and affirmed this Administration's top transportation priority of improving safety and creating opportunities for all Americans. The ramification of this extraordinary era will positively shape transportation in the coming decades.

## 25 Years Ago . . .

*Trends and Choices* was developed at a critical time in our nation's transportation history. The United States had just experienced a major energy shock in 1973 and would soon experience another in 1979 due to oil embargoes by OPEC—the Organization of Petroleum Exporting Countries. Kindled by recent memories of long gas lines, a major concern about petroleum fuel was availability—perhaps even more so than price. But in the aftermath of the 1973 shock, the public had returned quickly to its old driving habits, almost as though nothing had happened.

## A Chronology of Vision and Vigilance Under the Leadership of Secretary Rodney E. Slater

*"As we look to the future, I am confident that we are truly in on the ground floor of a new age of prosperity for everyone. And the role of transportation in this age is to create the links that make it happen. Transportation is truly the tie that binds."*

Rodney E. Slater

Secretary, Department of Transportation

October 2000

**National Drunk Driving Standard** – Confirming his consistent commitment of safety as the Clinton-Gore Administration's top transportation priority, President Clinton signed into law the "Department of Transportation and Related Agencies Appropriations Act, 2000." This Act provides critical transportation safety funding and contains a provision that will help set a national impaired driving standard at 0.08 Blood Alcohol Concentration, thereby reducing drunk driving on the nation's roads and saving lives.

**USDOT Performance Report Rated the Best in Government by the U.S. Senate** – The Senate Governmental Affairs Committee rated the USDOT's 1999 Annual Performance Report one of the best in government. The USDOT's Report was one of two agencies to be rated "A", out of 24 federal agencies. The Performance Report informs Congress and the public what USDOT is doing and how well we are doing in terms of our strategic goals under the Government Performance and Results Act (GPRA). In 1997, the USDOT's Strategic Plan and Performance Goals were also rated the best in the entire government. The USDOT plans to continue achieving improved results in safety, mobility, economic growth, human and natural environment, and organization excellence.

**International Transportation Symposium** – USDOT hosted the first International Transportation Symposium for world transportation ministers, industry leaders, academia, and the public to develop a bolder vision for a truly global transportation system and create the environment conducive to addressing the emerging challenges of the 21<sup>st</sup> century.

**Open Skies** – During the last eight years, the United States signed 51 Open Skies agreements with countries around the world. Under Secretary Slater's leadership, the United States signed 37 of these agreements, opening more markets and creating more opportunities for international air service than ever before.

July 2000

**10<sup>th</sup> Anniversary of the Americans with Disabilities Act of 1990 (ADA)** – In celebrating the 10<sup>th</sup> anniversary of the ADA, USDOT emphasized its commitment to envisioning accessibility as a civil right.

July 2000

**First to Achieve EEO Goal** – The USDOT became the first federal agency to achieve an important goal in equal employment opportunity complaint handling. DOT has eliminated its complaint backlog and has an aggressive compliance goal of zero backlog.

April 2000

**AIR-21** – The 2000 Wendell H. Ford Aviation Investment and Reform Act for the 21<sup>st</sup> Century (AIR-21) substantially increased funding for aviation safety, modernization and stability of critical air traffic services, and airport development.

March 2000

**New Generation of Vehicles** – The Partnership for a New Generation of Vehicles (PNGV) program celebrated a milestone. The PNGV partnership, started under Vice President Gore in 1993, brings together the federal government and the U.S. auto industry. It achieved a major goal when the three big U.S. automakers started marketing hybrid-electric vehicles with very low emissions and fuel efficiency of up to 80 miles per gallon. Another Vice-President Gore initiative, "A Research Initiative for 21<sup>st</sup> Century Trucks," will build on the PNGV success by cutting fuel use and greenhouse gas emissions of delivery vehicles while improving the safety and efficiency of the nation's trucking industry.

February 2000

**Moving Passenger and High-speed Rail into the Future** – The Clinton-Gore Administration consistently supported a national passenger rail system to help meet our nation's growing transportation needs in the 21<sup>st</sup> Century. Critical funding was provided to help Amtrak achieve self-sufficiency, improve and increase the speed of rail service, and lay the foundation for high-speed rail corridors. Passenger rail

service, including high-speed rail, will play a key role in meeting the nation's transportation needs and providing solutions to the effects of economic growth and urban sprawl.

January 2000

**Motor Carrier Safety** – The Department's newest agency, the Federal Motor Carrier Safety Administration was formed following passage of the Motor Carrier Safety Improvement Act and USDOT set a stretch goal to reduce the number of truck-related fatalities by 50 percent over 10 years.

December 1999

**Aviation in the 21<sup>st</sup> Century Beyond Open Skies Ministerial** – USDOT hosted an Open Skies Ministerial, attended by leaders from more than 90 countries, to expand and strengthen international aviation partnerships far beyond bilateral agreements. This ministerial promoted transportation policies that foster the Clinton-Gore Administration's goals for prosperity, stability, and democracy and was a follow-up to the historic meeting held in Chicago 55 years earlier.

September 1999

**Africa-US Transportation Ministerial** – USDOT hosted the first Africa-U.S. Transportation Ministerial for African transportation leaders to develop a vision of collaboration and partnership in transportation, safety, trade, and development.

**Marine Transportation System Assessment** – Secretary Slater submitted to Congress the first comprehensive assessment of the U.S. Marine Transportation System. This assessment was prepared by a congressionally mandated public- and private-sector task force under the leadership of the U.S. Coast Guard and the Maritime Administration.

July 1999

**Order on Accessibility** – A new USDOT Order on Accessibility was signed, stating that accessibility is a civil right. This Order and other activities put USDOT in the forefront of federal activities to lower barriers and obstacles to people with disabilities in their use of transportation infrastructure.

June 1999

**Innovation in Transportation** – Looking toward the future impacts of technological innovation in transportation, USDOT hosted the "Spirit of Innovation in Transportation" conference to foster a climate of ongoing innovation. Secretary Slater challenged the transportation community to work toward a transportation system that is innovative in scope, international in reach, intermodal in form, intelligent in character, and inclusive in service.

May 1999

**Transportation and Community Livability** – USDOT made the first awards under the new TEA-21 Transportation and Community and System Preservation program, established to enhance our understanding of links between land use and transportation. Under Secretary Rodney Slater's leadership, the USDOT has ensured that transportation programs support the Clinton-Gore Administration's community livability efforts. Such efforts include development of information on USDOT programs supporting livability, initiation of ONEDOT partnership efforts, and implementation of the Delta, New Markets, and Rural initiatives. The USDOT has used tools and resources to preserve green space, ease traffic congestion, restore a sense of community, pursue regional smart growth strategies, and enhance economic competitiveness.

March 1999

**Transportation and Community Development** – The USDOT showed strong commitment to new markets and emerging corridors and initiated major programs to use transportation in promoting economic development in the Appalachian region, the Delta region, and in Rural America. Although we have made progress in improving transportation in these underserved regions of America, more needs to be done so that no region in the country is left behind. Transportation could bring greater economic opportunity and improved quality of life to communities in these regions.

**National Transportation Safety Conference** – In partnership with the safety leadership of the transportation community, the USDOT hosted the first ever national safety conference involving all modes of transportation that had two significant outcomes on partnership and promise. The partners developed an aggressive safety action plan and committed to make safety their top priority to the American people. Safety is the USDOT's North Star by which we are guided and willing to be judged. The safety partnership was challenged to embrace safety as a promise we make and keep together. Progress has been made since this conference, including efforts to improve data for strategic and operational transportation decision, development and use of advanced safety technologies, and promotion and funding of enforcement of transportation-related laws and regulations.

*continued next page*

January 1999

**New Rule Revising USDOT's Disadvantaged Business Enterprise (DBE) program** – USDOT announced a significant new rule revising the Department's Disadvantaged Business Enterprise (DBE) program, a major component of the Administration's commitment to minority businesses. The new rule assures that help is extended to those businesses that need it the most. USDOT has one of the largest DBE programs in the federal government, thus ensuring minority and disadvantaged access to federal contracts.

December 1998

**Western Hemisphere Transportation Partnerships** – Secretary Slater continued the Clinton-Gore Administration's goal to promote free trade, economic development, and democracy throughout the Americas. Secretary Slater hosted a Transportation Ministerial for the 34 nations of the Western Hemisphere at which a two-year action plan was adopted to improve transportation safety and security, to continue the integration of transportation policies and programs across national and modal lines, and to enhance disaster prevention and relief.

November 1998

**Marine Transportation System National Conference** – Under Secretary Rodney Slater's leadership, the USDOT collaborated with other federal agencies and numerous private-sector stakeholders to develop a bold and comprehensive plan to modernize our nation's Marine Transportation System (MTS), as required in The Coast Guard Authorization Act of 1998. The MTS vision is to be the world's most technologically advanced, safe, secure, efficient, effective, globally competitive, and environmentally responsible system for moving people and goods by 2020.

**OneDOT** – Secretary Rodney Slater challenged the Department to reinvent our workplace culture to better serve the American people through teams that produce higher performance goals by working better together across all modes.

June 1998

**TEA-21** – The 1998 Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) guaranteed a record \$200 billion in surface transportation investment for highway safety, highways, transit, and other surface transportation programs for six years.

**Transportation Infrastructure Finance and Innovation Act** – Authorized under TEA-21, The Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) provided direct loans, loan guarantees, and lines of credit to private and public sponsors of major surface transportation projects, epitomizing the importance of public-private partnerships under the Clinton-Gore Administration.

**National Transportation Library** – Embracing advances in information and communication technology, TEA-21 established the National Transportation Library within the Bureau of Transportation Statistics. The library, an electronic repository of materials from public and private organizations around the country, facilitates the exchange of transportation-related information. This Library will allow USDOT to meet emerging information challenges of the future.

November 1997

**First Electronic Docket on the Internet** – Secretary Rodney Slater broke new ground by unveiling the first electronic docket on the Internet to involve Americans in the governmental decision-making process. This improves access to government information, improves service to the American people, and makes government more efficient.

October 1997

**Africa Transportation Initiative** – Secretary Rodney Slater led the Clinton-Gore Administration's Partnership for Growth and Opportunity in Africa. USDOT promoted sustainable improvements in aviation safety and airport security, trade and market development, technical assistance and technology transfer, and human capacity building throughout Africa.

June 1997

**USDOT Strategic Plan Rated Best in Government by the U.S. Senate** – Under the leadership of Secretary Rodney Slater, USDOT's Strategic Plan 1997-2002 was rated the best in government by the Senate Governmental Affairs and Appropriations committees under the GPRA. The Strategic Plan sets aggressive performance goals in safety, mobility, economic growth, human and natural environment, national security, and organizational excellence; and it identifies measures to gauge progress. The Department increased its investment in America's infrastructure while reducing staffing.

May 1997

**Garrett A. Morgan** – Under Secretary Slater’s visionary leadership, the USDOT started the Garrett A. Morgan Technology and Transportation Futures Program to enhance transportation education at all levels by leveraging the Department’s current technology, education, and research program through public/private partnerships. Garrett A. Morgan (1877-1963) was an African-American inventor whose lifetime of contributions includes the invention of the traffic signal.

April 1997

**30<sup>th</sup> Anniversary of U.S. Department of Transportation** – The USDOT, celebrating its 30<sup>th</sup> anniversary, is positioned to remain more vigilant and visionary, committed to making the American transportation system safer.

January 1996

**Intelligent Transportation Systems** – Under Secretary Federico F. Peña, the USDOT challenged the transportation community to embrace advances in ITS technology to save time and lives and improve quality of life.

November 1995

**National Highway System Designation** – President Clinton signed the National Highway System Designation Act passed by the Congress, formally establishing the National Highway System (NHS). The NHS has focused federal resources on the most heavily used highways and on those that link other key elements of the transportation system, such as ports, international border crossing points, major airports, and public transit facilities.

April 1995

**Transportation and Environment Policy Statement** – Under the leadership of Secretary Rodney Slater, the Federal Highway Administration (FHWA) expanded the definition of environment far beyond “natural” and “scenic” to include the built environment, the cultural and social fabric of our country, our neighborhoods, and the total quality of life of all Americans. This was part of his overall vision to redefine transportation beyond public works of concrete, asphalt, and steel to one about creating opportunities for all Americans.

August 1994

**Hazardous Materials Transportation Authorization Act of 1994** – This Act became law under Secretary Federico F. Peña and made the American transportation system safer by improving federal hazardous materials transportation provisions.

October 1993

**The Federal Highway Administration** – FHWA celebrated 100 years of service to the country. Record levels of infrastructure investments provided under the Clinton-Gore Administration have positioned the FHWA to continue to make our nation’s highways safer.

August 1993

**Livable Communities and Transportation** – The USDOT announced the first Livable Communities grant to the Metropolitan Transportation Commission. The USDOT has continued to support communities by encouraging transit-oriented commercial and residential development and supporting improved access to transit service.

August 1993

**Government Performance and Results Act of 1993 (GPRA)** – President Bill Clinton signed the GPRA to require government agencies to develop three important performance measurement systems: strategic plans, performance plans, and performance reports. The USDOT aggressively responded with our organizational excellence goal, which advances the Department’s ability to manage for results and innovation.

July 1993

**The Americans with Disabilities Act (ADA) Key Station Compliance** – This Act took effect and required all transit stations, unless granted extension by the USDOT, to be readily accessible to and usable by individuals with disabilities.

Source: U.S. Department of Transportation, December 2000.

Table 1-1

	1975	1990	1990	2000	2025
Forecasts Past and Future	Actual	Coleman forecast	Actual	Estimated	Forecast <sup>13</sup>
<b>Transportation Context</b>					
Population (millions) <sup>1</sup>	215	247	249	275	338
GNP (constant 1975 \$, billions) <sup>2</sup>	\$1,598	\$2,830	\$2,409	\$3,049	\$5,486
GNP Per Capita (1975 \$) <sup>2</sup>	\$7,417	\$11,457	\$9,675	\$11,087	\$16,240
GDP (constant 2000 \$, billions) <sup>3</sup>	NA	NA	NA	\$9,942	\$18,258
<b>Passenger Transportation</b>					
Passenger-Miles (billions) <sup>4</sup>	2,560	3,850	3,946	5,036	8,438
Passenger-Miles Per Capita <sup>4</sup>	11,881	15,600	15,847	18,313	24,979
Licensed Drivers (millions) <sup>5</sup>	130	161	167	190	243
Vehicles (millions) <sup>6</sup>	138	170	193	219	262
<b>Freight Transportation<sup>7</sup></b>					
Total Ton-Miles (millions)	2,285,000	4,394,706	3,196,000	3,959,432	5,098,888
Rail*	754,252	1,845,777	1,033,969	1,416,446	1,484,802
Water (domestic ton-miles)	565,984	1,010,782	833,544	763,540	NA
Water (domestic and foreign tons)	1,695	NA	2,164	2,453	3,429
Truck (intercity)	454,000	703,153	735,000	1,130,132	2,121,837
Air	3,470	8,789	9,064	15,904	33,925
Pipeline	507,000	834,994	584,000	633,410	797,950
<b>Safety<sup>8</sup></b>					
Transportation fatalities	49,214	45,500	47,248	42,600	40,300
<b>Air Pollution<sup>9</sup></b>					
CO (millions of tons)	85.27	27.00	61.18	50.48	24.24
NO <sub>x</sub> (millions of tons)	9.45	8.82	8.51	8.66	7.98
Greenhouse gas emissions <sup>10</sup>	350.00	NA	420.00	500.00	600.00
<b>Energy<sup>11</sup></b>					
Btu <sup>12</sup> (trillions)	16,998	16,700	24,070	25,200	36,600

\* The FRA forecasts a two percent average annual growth rate for the 2000-2025 period. This translates into 2.4 trillion ton-miles in 2025.

<sup>1</sup>Population projections are taken from U.S. Department of Commerce, Bureau of the Census, Annual Projections of the Total Resident Population as of July 1: Middle Series Projections for 2000 and 2025.

NA = not available.

The Clean Air Act of 1970 had introduced vehicle emission standards and local plans for meeting national ambient air quality standards to be administered by a new agency—the Environmental Protection Agency. The Federal Task Force on Motor Vehicle Goals Beyond 1980 issued a report in 1976 recommending fuel consumption standards for a new vehicle fleet while dealing with often conflicting requirements to preserve personal mobility, reduce emissions, and enhance safety. Many public research efforts were launched after 1973, focusing on alternative fuel technologies. It was for these reasons, among others, that a national document like *Trends and Choices* would have a special section devoted to the automobile.

Issues of expanding safety regulation and economic deregulation of common carriers for both passengers and freight were at the forefront of policymaking. American railroads were in serious difficulty with rates of return that, at best, did not permit adequate investment. Amtrak had been created in 1970 as part of a divestiture process. Conrail had just been created from a family of bankrupt Eastern and Midwestern railroads. Congress was also considering legislation to reduce the economic regulatory burdens imposed on carriers by the Interstate Commerce Commission (ICC), which oversaw rail, truck, and intercity bus activities; and the Civil Aeronautics Board (CAB), which oversaw air passenger and freight activities. The U.S. maritime industry was in a long decline from its once-dominant position in the world.

Thus, at the time *Trends and Choices* was issued in 1977, every sector of the transportation system faced significant challenges; however, unlike today, system capacity was not a major issue.

<sup>2</sup>Forecasts for GNP are based on 1975 through 1999 data, using log linear (Holt) exponential smoothing model, parameters optimized through SAS/ETS software.

<sup>3</sup>Forecasts for GDP are based on 1929 through 1999 data, using damped trend exponential smoothing, parameters optimized through SAS/ETS software.

<sup>4</sup>Forecasts are based on 1990 through 1997 data, using damped trend exponential smoothing, parameters optimized through SAS/ETS software.

<sup>5</sup>Forecasts are based on 1949 through 1998 data, using damped trend exponential smoothing, parameters optimized through SAS/ETS software.

<sup>6</sup>Forecasts for vehicles are based on 1990 through 1997 data, using double (Brown) exponential smoothing, parameters optimized through SAS/ETS software.

<sup>7</sup>Forecasts for total ton-miles are an aggregate of the individual forecasts by mode. Forecasts for rail ton-miles are based on 1990 through 1998 data, using damped trend exponential smoothing, parameters optimized through SAS/ETS software. Forecasts for water ton-miles are based on two forecast models: log damped trend exponential smoothing based on 1990 through 1997 data, and log simple exponential smoothing based on 1960 through 1995 data in five year increments; the two forecasts are combined with equal weights. Forecasts for truck ton-miles are based on two forecast models: linear trend based on 1990 through 1997 data, and double (Brown) exponential smoothing based on 1960 through 1995 data in five year increments; the two forecasts are combined with equal weights. Forecasts for air ton-miles are based on two forecast models: linear trend based on 1990 through 1998 data, and damped trend exponential smoothing based on 1960 through 1995 data in five year increments; the two forecasts are combined with equal weights. Forecasts for pipeline ton-miles are based on 1990 through 1997 data using log linear trend. All forecast model parameters optimized through SAS/ETS software.

<sup>8</sup>Forecasts are based on 1990 through 1998 data, using damped trend exponential smoothing, parameters optimized through SAS/ETS software.

<sup>9</sup>Forecasts for CO are based on 1985 through 1997 data, using log linear trend parameters optimized through SAS/ETS software. Forecasts for NO<sub>x</sub> are based on 1985 through 1997 data, using double (Brown) exponential smoothing, parameters optimized through SAS/ETS software. Forecasts for greenhouse gas emissions are based on expert opinion.

<sup>10</sup>Millions of metric tons of carbon equivalent, excluding bunker fuels.

<sup>11</sup>Forecasts based on 1990 through 1997 data, using double (Brown) exponential smoothing, parameters optimized through SAS/ETS software.

<sup>12</sup>Btu: British thermal unit.

<sup>13</sup>The 2025 forecasts are purely statistical. For sources of data used in these forecasts see page 1-32.

---

## As the Last Quarter Century Unfolded . . .

Perhaps the centerpiece of transportation policy over the last 25 years has been the economic deregulation of aviation, trucking, intercity buses, railroads, and, recently, the ocean shipping industry. These actions produced profound impacts not only on the structure of these industries, but also—because of enhanced competition—on their performance rates, fares, and quality of service.

Airlines and railroads continue to experience major consolidations through mergers, alliances, and buyouts. Lowered entry barriers have allowed new small air carriers, thousands of small trucking companies, and regional intercity bus companies to offer services, and have brought about the resurgence of regional and short-line railroads. At the same time, enhanced competition within each industry has lowered fares and freight rates.

Growth brought about by deregulation has provided unprecedented levels of mobility and contributed to the enormous economic prosperity of the last decade. Since 1975, passenger-miles of travel have nearly doubled, just as economic production has nearly doubled over the same period. Yet the number of transportation fatalities continues to decline, and most measures of air pollution/emissions have declined as well. Energy use has risen; but with gains in energy efficiency, cars now get close to 33 percent more miles per gallon than they did 25 years ago.

Technology has played a critical role in enabling change. During the past quarter century, the aviation system has moved to satellite-based communications, navigation, and surveillance systems. Global Positioning System (GPS) technology has provided major advances in positioning accuracy for maritime shipping, railroads, and highway vehicles as well. Cars are no longer controlled by purely mechanical devices, as they were in 1975. Instead, microchips control many mechanical components. How much of this could have been anticipated?

## Forecasting

Even in the most tranquil of times, projecting trends into the future is an undertaking filled with challenges and pitfalls. Still, the forecasts made in *Trends and Choices* were fairly accurate. And history is instructive. The past suggests that most of the technologies likely to be deployed widely over the next generation are ones that either exist today or are under development. It is imperative that we invest in research and development today to support future generations. Even while we might safely forecast that the pace of change will quicken, history cautions us to avoid assuming that futuristic visions will quickly become reality (table 1-1). The past suggests that public acceptance of new technologies or policies can play a major role in whether they are deployed or implemented. The past also has shown that many changes will be associated with *wild cards*—developments like wars, recessions, or other phenomena that we know might occur but which we cannot forecast with any confidence. Perhaps most importantly, through *Trends and Choices*, Secretary Coleman demonstrated that well-informed policy decisions can have important effects on the ultimate outcomes for transportation.

*"In 1970, U.S. per capita income was 31 percent higher than that of other major industrialized countries. By 1991, that difference had narrowed to only 10 percent. But with the dawn of the Internet Age, the gap has started to widen again—to more than 22 percent this year."*

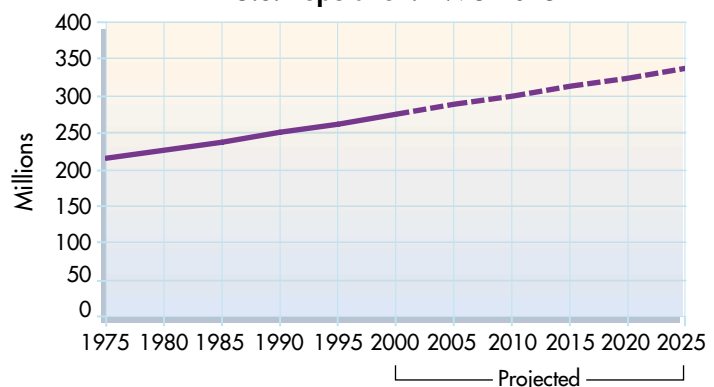
Michael S. Mandel  
Business Week  
Oct. 4, 1999

## The Transportation Context

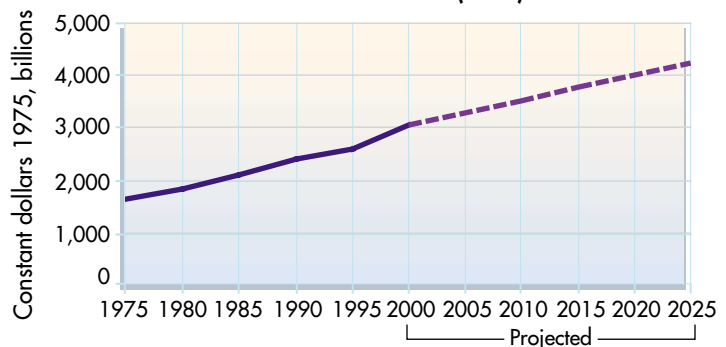
During the Clinton-Gore Administration, a steady growth in population and strong economic growth increased demand for transportation services. By 1998, under the leadership of Transportation Secretary Rodney Slater, Congress provided nearly \$200 billion over six years in surface transportation investment, an increase of nearly \$50 billion over previous funding (see box 2-1 in chapter 2).

In 1975, the U.S. population was growing steadily, with most of the increase due to migration, and the economy was picking up after a recession. The U.S. population stood at 215.9 million, the Gross National Product (GNP) was \$1,598.4 billion, and GNP per-capita—a commonly used indicator of economic well-being—was \$7,400 per person.

U.S. Population: 1975-2025



U.S. Gross National Product (GNP): 1975-2025



At the time of *Trends and Choices*, the U.S. population was projected to grow by about 0.5 percent compounded annually over the next 15 years to 247 million. Real GNP was projected to grow at a faster rate — by about 2.3 percent per year — to \$2.83 trillion, or about \$11,460 per person (in constant 1975 dollars).

By 1990, without any major social upheavals over that period, the population actually grew to a level almost exactly as forecast—to 249 million. But the nation's economy had been buffeted by another major oil shock in 1979 and had stagnated through the 1970s and 1980s. With high levels of inflation accompanying slow growth, economists came to call this unusual phenomenon "stagflation." GNP fell short of the projections by 15 percent—\$2.41 trillion vs. \$2.83 trillion projected in *Trends and Choices*. Real GNP per-capita fell short of the \$10,000 forecast by Coleman for 1990.

Under the leadership of President Clinton and Vice President Gore, we have witnessed a continuing rise in population, still largely through immigration, and the longest expansion of the economy in our nation's history. Making up for the pause in growth during the 1980s, the economy has grown to an estimated \$9.9 trillion in 2000, and per-capita Gross Domestic Product (GDP)<sup>1</sup> stood at about \$36,153 thousand in 1998 or about \$11,100 in 1975 dollars.

Over the next 25 years, the U.S. population is likely to continue growing at an average annual rate of change of about 0.82 percent, reaching a level of 337 million by 2025. But the age distribution of the population will continue to change significantly. The median age has risen from 28.8 in 1975 to 35.2 in 1999, and it is expected to reach 38.0 by 2025 [USDOC Census 1999]. These changing demographics will challenge transportation decisionmakers both directly and indirectly through the makeup of the workforce, consumer preferences for products and services, and the numbers of youthful and aging drivers, among other things.

Economic projections tend to be more near-term. But the Congressional Budget Office's estimates suggest growth in production at a substantially faster rate than population growth—about 2.7 percent compounded annually over the next 10 years [CBO 2000]. Projected forward, we might expect GDP to reach \$29 trillion by 2025. In that event, per-capita GDP might well be close to 1.5 times today's level in *real terms*.

One facet of the trends in this period was the growth in workers that resulted from the baby boomers coming of working age from the mid-1960s to the mid-1980s and the growth in women joining the labor force. In the 1980s, more people were added to the labor force than to total population. Women's increasing involvement in the workforce shifted the historical pattern in which one-third of working-age women worked to one in which one-third of women of that age group did not work. By 1975, female labor force participation had risen to 47.3 percent; by 1998, it stood at 59.4 percent. It is to the great credit of the U.S. economy that the surge of workers found jobs in a thriving economy. Today, the ever-increasing demand for workers directly supports President Clinton's welfare reform plan, and an increasing number of welfare recipients are transitioning to the job market.

Population and economic production have always been important factors in shaping the nation's travel patterns. As population grows, travel generally rises proportionately. But changes in the age distribution, geographic distribution, and even immigration can affect travel volume and patterns as well. Economic well-being can brake or accelerate the use of the transportation system, while changing the mix of transportation modes or trip purpose. Also, internationally, population growth and globalization of the economy will amplify both trade and passenger flows. Thus, demographics and economics provide an important part of the context for transportation decisionmaking by individuals, government, and in private industry.

**Transit ridership grew from 7.4 billion passenger trips in 1993 to 9 billion in 1999 – the highest level since 1964.**

<sup>1</sup> Since 1992 the United States changed from GNP to GDP as the aggregate measure of the size of the economy to better reflect the domestic production capacity of the country. In 1992, U.S. GNP was \$24,490 per capita in current 1992 dollars, while GNP was \$24,447 per capita in current 1992 dollars.

Today, highway vehicle-miles traveled exceed 2.6 trillion per year and continue to grow. Transit ridership reached 9 billion in 1999, the highest in 40 years. Commercial airports handled more than 8.5 million flights, nearly double the number of flights handled in the mid-1970s. By 1999, U.S. domestic revenue passenger-miles had climbed to 473 billion and will continue to increase.

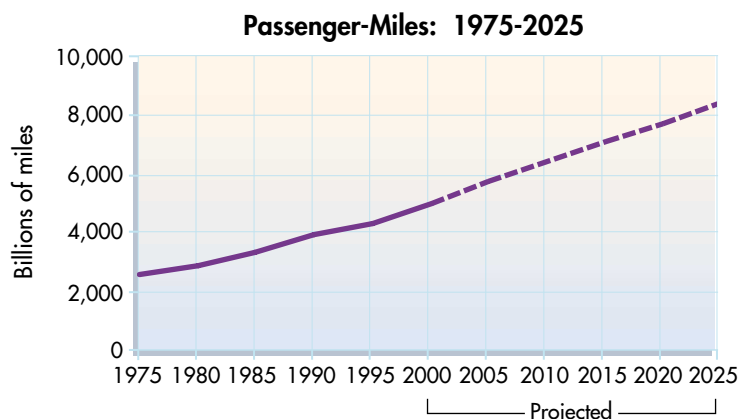
Increased demand for transportation brings increased safety, security, energy, environmental, and congestion concerns. The challenge will be to address these concerns while developing innovative solutions to ensure the free flow of goods and people within and among all of the various modes of transportation, to allow people to be even more productive with their time, to experience new things, and to always be connected.

## Passenger Travel

In 1975, Americans used the automobile for more than 90 percent of their travel (by mileage), and travel by automobile was continuing to rise faster than the population was growing [USDOT 1977]. Therefore, it was natural that *Trends and Choices* would forecast what we would see by 1990:

- 50.4 percent rise in passenger-miles,
- 23.4 percent rise in licensed drivers, and
- 23.2 percent rise in the number of vehicles on the highways.

What is a little surprising is the accuracy of these forecasts even while the economy fell short of forecasts by 14.9 percent. Passenger-miles per capita, in particular, were almost exactly as projected. The number of licensed drivers grew to a level slightly (3.7 percent) more than projected. But the number of vehicles increased to an astonishing 193 million—23 million more than expected only 15 years before. The number of light trucks and sport utility vehicles (SUVs) alone grew by more than 23 million.



Evidently, the American fascination with automobiles was tied much more loosely to the economy than originally thought. And vehicles were starting to last longer, so even moderate levels of new car purchases inflated the national inventory. The increase in telecommuting, e-commerce, and other advances that can be a substitute for transportation will likely slow the growth in transportation demand. However, continued growth in the demand for transportation may result in more attempts to control demand through pricing, regulation, and other mechanisms.

Over the past 10 years, passenger travel rose even more steeply than during earlier decades as the economy grew rapidly. Highway travel (as measured in passenger-miles) has continued to dominate—still accounting for 90 percent of travel—while air travel accounts for another 9 percent, and the other modes together account for the last one percent. Until the past decade

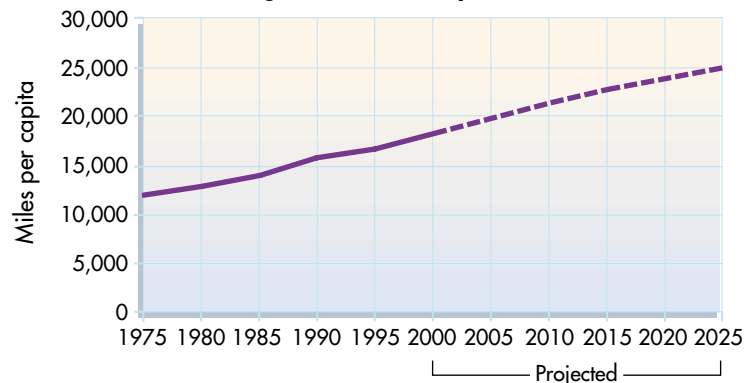
or so, about every five years highway travel lost a percent of the modal share, while air travel gained a percent. Reasons for this shift include lower costs, faster travel, and an increased willingness to travel longer distances and visit more places.

The next 25 years present some real uncertainties. While vehicle miles of travel (VMT) certainly have risen over the last 25 years, today congestion presents a real challenge. Our strong economy has increased demand and created capacity challenges. Record-level investments have made funding available, but we cannot build ourselves out of this situation. We cannot build enough lanes or roads in most places where capacity is needed.

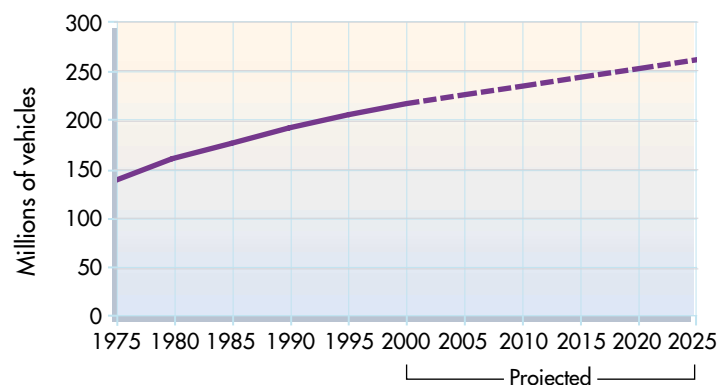
The current market share of transit—and its capacity in some geographic areas—is limited, and currently forms only a small part of the solution. Although transit ridership has been growing at a rate faster than automobiles in some urban areas, its full potential to ease congestion is yet to be realized. The market share of transit—and its capacity in some areas—must be expanded. The other main mode of passenger travel—aviation—is also beset by capacity problems, with significant public concern about flight delays and cancellations, even now. Three current options offer hope. First, Intelligent Transportation Systems (ITS) technology offers one option, as metropolitan areas across the country are actively deploying some of these technologies to improve the capacity of the highway system. Second, modernization of the nation's air traffic control system offers another part to the overall solution for transportation. Third, continued investment in airport capacity that will allow increasing aviation activity that is compatible with environmental standards.

For some time now, we have had the tools necessary to advance telecommuting. But, there may be some aspects of the way we work that are preventing greater market penetration. Recall that no less a visionary than Thomas Alva Edison predicted the demise of the

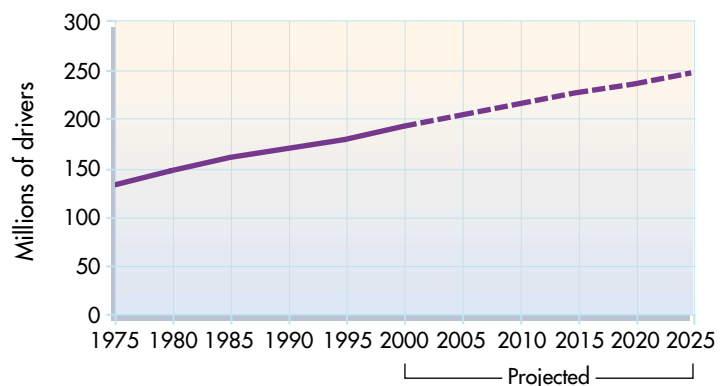
**Passenger-Miles Per Capita: 1975-2025**



**Vehicles: 1975-2025**



**Licensed Drivers: 1975-2025**



conventional classroom with the advent of films and radio. As work is becoming more information- and innovation-oriented, team development is becoming more important. Systems are becoming more complex. As one is less and less able to master entire systems, trust is perhaps becoming more critical, and face-to-face contacts are needed to develop that trust. In fact, it seems that workplaces are beginning to pay more attention to “professional emotional” relationships. These take time and close interaction. We can support efforts to continue to increase telecommuting.

By 2025, travelers will have widespread, real-time access—any time, any place—to information of all types, such as transportation availability, geographic location, and operating conditions over various segments of a trip. Passenger-miles of travel will increase faster than the growth in travel experienced during the 1990s—from 5 trillion miles in 2000 to 8.4 trillion in 2025, provided that capacity issues can be adequately addressed. A corresponding rise in global travel will also occur.

### Box 1-3

#### **Forces of Change Affecting Commuting, Land Use, and Other Travel (in this decade and beyond)**

**The Democratization of Mobility**—Everyone can travel—the number of vehicles in the nation exceeds the number of drivers. Currently, the saturation in drivers licenses and vehicles is really the saturation of the white population alone. As affluence increases, more African-American, Hispanic, and Asian households will acquire both licenses and vehicles. This equalizing of mobility will be critical to both the ability to fully exploit job opportunities and to expand the ability to enjoy social and recreational opportunities.

**Aging of the Population**—As future numbers of older and retired people increase, travel patterns and levels will change as well. Travel in nonpeak hours may increase at a greater rate, relative to commuting travel, as the retired have more time for leisure activities.

**Changing Immigration**—With immigration returning to turn of the 20<sup>th</sup> century levels, immigrants will become a critical factor in future commuting patterns. In 1998, close to 60 percent of arrivals from abroad went directly to metropolitan suburbs, rather than the cities. While new immigrants may initially stimulate transit use over time, they may make other travel choices.

**Growing Affluence**—Rising incomes increase auto availability and use, trips per household, and average trip lengths. As the means to travel increase, people consume more transportation. With 70 percent of the nation’s workers living in two-or-more-worker households, commuting trips become longer, more auto-centered, and more likely to be in a peak period. Household income levels of \$25,000 appear to be the threshold for shifts to private vehicles for transportation.

**Dispersal Technologies**—Transportation services, both ground and air, have been a key factor in dispersing the population by making formerly remote areas highly connected to the rest of the country. Airport congestion will push development to areas with excess capacity. Airports will be the economic engines of the 21<sup>st</sup> century, not unlike the seaports and railroad stations at the turn of the 20<sup>th</sup> century. The Internet, computers, and future technologies will further loosen constraints on dispersal, expanding the freedom to work anywhere.

Source: Alan Pisarski, excerpts from speech to the “Road Gang,” Channel Inn, Washington, DC, June 15, 2000.

There will be greater concerns for the safe mobility of older adults, who will make up one-sixth of the population. New technologies will be employed to keep them driving safely longer, as they continue to use the automobile as their main source of transportation. And more user-friendly, reliable forms of nondriving transportation will be perfected, providing older adults with additional options.

While traveling in the future will be different, the basic modes we use are unlikely to change. What will change are the characteristics of these systems, how we use them, and how we construct our daily routines, all of which will help enhance the quality of the transportation experience. Certainly, technology, automation, and the prospect for increased affluence will play major roles. And capacity is going to have to be addressed head-on, even if just to avoid constraining the U.S. economy.

With the unveiling of “Acela,” Amtrak’s new high-speed train service (with speeds reaching 150 mph) in the Northeast Corridor, the interest in high-speed, rail-based ground transportation continues to grow. It is expected that by 2025 most of the corridors in the nation will have a high-speed train service. The advent of MagLev (magnetic levitation) over the next 25 years will present intercity travel times that will rival those of air travel.

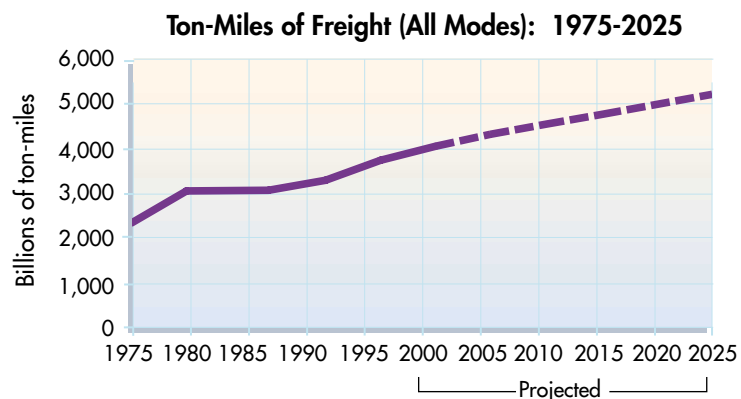
Increased use of ferryboat systems is being looked at as a measure to address congestion in major metropolitan areas like San Francisco, New York City, and Seattle. The U.S. Marine Transportation System (MTS) report, submitted by the USDOT to Congress in 1999, estimates very rapid growth of the high-speed passenger ferry industry. Ferries traveling up to 80 knots or more will be used to compete with other forms of transportation. The growth in the ferry industry is expected to continue over the next 25 years and will require improvements to the port infrastructure and a continuing focus on prevention programs to minimize risk to passengers.

## Freight Transportation

In 1975, the U.S. economy was more product- and less service-oriented than it is today. The domestic transportation system handled about 2,285 billion ton-miles of freight—or a little over 1.4 ton-miles per dollar of GNP. Freight tonnage was split among rail (33 percent), water (25 percent), pipeline (22 percent), and truck (20 percent) by modal share; air transportation accounted for much less than 1 percent of ton-mileage. Over-regulation and energy costs were among the more visible issues. But the demand for freight transportation was growing rapidly.

*Trends and Choices* forecast 92 percent growth in ton-miles by 1990—even more than the 77 percent projected growth in real GNP. In fact, while GNP fell somewhat short of the forecast, freight traffic fell short even more. By 1990, real GNP was up about 50 percent while total ton-miles were up only 40 percent. Two important things were happening. The economy had cooled, and changes in the nature of U.S. production had reduced the overall tonnage for a given level of national output. In particular, the service sector of the economy grew disproportionately. Changes in the type of commodity moving (higher value-added-per-unit-weight commodities like computers, electronic equipment, and the like) might also have reduced the tonnage.

*Trends and Choices* overestimated total freight ton-miles by some 27 percent, but the modal split also shifted significantly and unexpectedly. Rail tonnage fell short of predictions by 44 percent, pipeline by 30 percent, and water transport by 18 percent. Trucking and air transport were slightly less



than predicted. The large difference in the rail mode, in particular, is probably a reflection of the large increase in the price of petroleum that was expected but did not materialize, which would have made rail relatively more attractive compared to trucking.

Over the past 10 years, freight ton-miles have grown another 23 percent—just trailing the growth in the U.S. economy. Large increases in truck and rail freight together can account for this growth. Trucking, in particular, increased its modal share from 23 to 30 percent in just 10 years. By contrast, domestic waterborne transportation declined fairly dramatically, from a 26 percent share to an 18 percent share. Pipeline transportation grew, but more modestly than other modes. Aviation grew by more than 70 percent. While it remains a very small part of freight transportation by tonnage, aviation accounts for about 30 percent of the value of U.S. merchandise trades, and this share will increase.

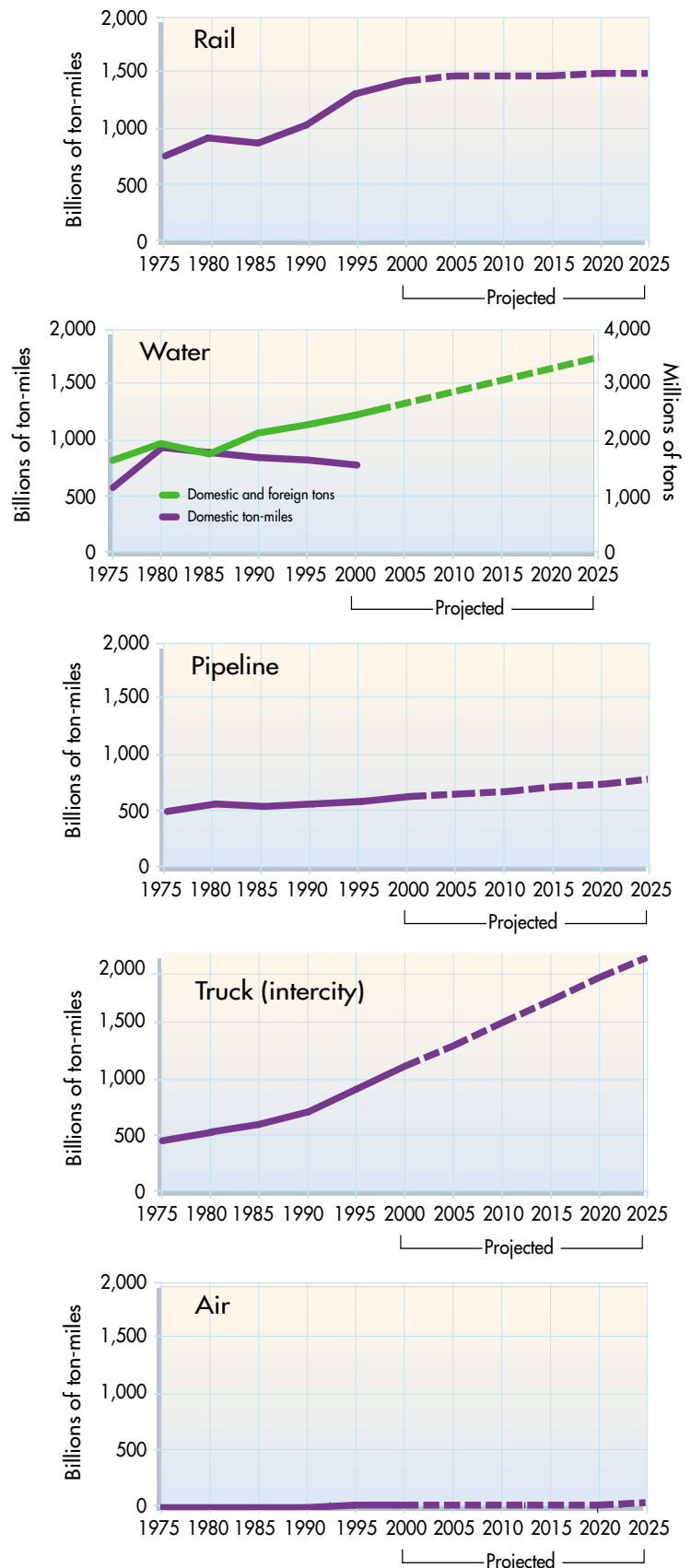
The next 25 years will be a challenging time for all sectors of the freight community. Congestion and capacity issues are already facing every mode. Intermodal connections need to be made more efficient.

Much of the transportation infrastructure requires modernization. Workforce shortages are projected. At the same time, e-commerce and increasing globalization of the economy could increase transportation demand. Just-in-time inventory systems are likely to move even more inventory out of warehouses and into the transportation system, requiring both system capacity and greater reliability. And economic production (GDP) is likely to grow by 84 percent, in 2000 dollars.

Given all these factors, we expect freight transportation to grow to just over 5 billion ton-miles by 2025—a 29 percent increase over our current estimates. But we also expect further shifts in how freight is moved and freight transportation is managed:

- A high volume of smaller shipments to satisfy low or noninventory

**Ton-Miles of Freight by Mode: 1975-2025**  
(based on statistical forecast in table 1-1)



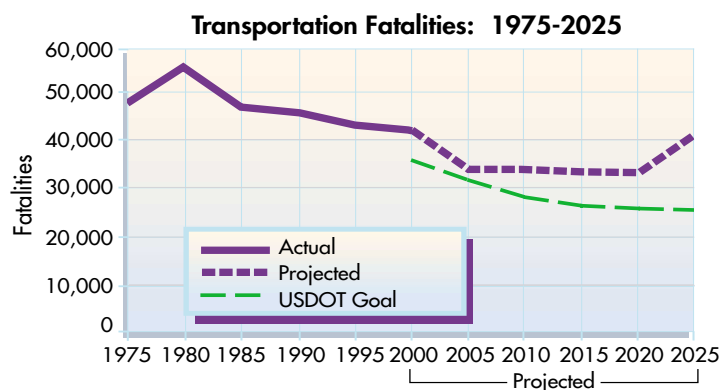
production and distribution requirements and express package delivery. Highly integrated freight transportation companies that provide full logistics/transportation services using multiple modes.

- The U.S. Coast Guard (USCG) estimates that while domestic water freight movement is expected to increase moderately over the next quarter century, foreign waterborne commerce is expected to double during the same period. A significant increase in international freight movement will require much larger ships; deeper channels; and high-capacity, highly efficient intermodal cargo-handling ports. The innovative marine transportation system initiative started by Secretary Slater will be an important catalyst to address the changes necessary to meet the challenges this growth will present.
- A rapid growth in trucking due to the increase in point-of-sale and just-in-time inventory systems, express package delivery, and e-commerce. Trucks will continue to dominate the freight transportation market, although their share of the primary shipment tonnage transported in the United States is expected to remain relatively constant for the next 10 years.
- Air cargo growth is expected at a pace even greater than today's because of e-commerce and globalization. Larger aircraft, both dedicated freighters and passenger aircraft with excess storage capacity, will carry cargo.
- FRA projections show that rail ton-miles will grow an average of 2 percent per year between 2000 and 2025.

The evolutionary changes of the past 25 years have created a highly efficient, market-driven freight system with increased responsiveness and lower costs to consumers and producers. But the success of our nation's freight movement system has generated a new set of issues—and future choices to be made—in areas of freight system development, utilization, and management. *The size and shape of the transportation system will be determined to a large extent by strategies for capital investment, financing, research and technology, and balancing mobility needs with safety and environmental considerations.*

## Transportation Safety

Safety concerns have always been a critically important area of emphasis for the public sector. Safety is the Clinton-Gore Administration's top transportation priority and the Department's "North Star" by which we set our goals and policies to improve safety in all transportation modes. Under the Clinton-Gore Administration, the transportation system as a whole is the safest it has ever been. Advances in technology, our renewed focus on partnerships aimed at positively changing human factors, and effective legislation offer great hope for progress in reducing transportation crashes and fatalities.



In 1975, the nation saw nearly 50,000 fatalities associated with transportation. Highway crashes were the leading cause of death for individuals between 1 and 44 years of age, and accounted for 95 percent of all transportation fatalities [USDOT 1977].

At the time of the *Trends and Choices* report, the authors reasoned that if nothing were done, we would “lose the race with increased travel” and the total number of deaths would rise substantially. It was thought that by 1990 the highway death toll could exceed 60,000 per year [USDOT 1977]. This was clearly unacceptable.

Instead, Secretary Coleman established a planning goal to implement countermeasures that would cut the fatality rate (fatalities per 100 million vehicle miles of travel) in 1990. “The goal is not, of course, to have 40,000 fatalities in 1990 but to cut the fatality rate by more than 40 percent and to save more than 20,000 lives that year compared to what the situation would be without the countermeasures.” [USDOT 1977]. The resulting forecast—adjusted for this ambitious plan—was 45,500 transportation fatalities in 1990.

That forecast was remarkably close to the actual number: 47,247 fatalities in 1990. Despite the rapid growth of transportation usage, the number of fatalities had actually declined, with safety gains in almost every category. Highway fatalities—still the dominant component of overall transportation safety—essentially held steady in the face of a 60 percent rise in vehicle-miles of travel [USDOT BTS 1999]. That accomplishment, alone, explains most of the difference between the original “no intervention” projections and the actual numbers by 1990. Meanwhile, maritime and aviation fatalities each dropped by more than 40 percent, and rail fatalities fell by 13 percent [USDOT BTS 1999]. And since then, transportation fatalities have dipped below 44,000.

Most advances in highway safety have come from improvements in road and motor vehicle design, increased seat belt use, decreased drunk driving, and improvements at rail grade crossings. Public awareness campaigns, launched by the USDOT in cooperation with non-profit organizations, have also helped improve safety. We expect additional improvements from advances in motor vehicle road designs, in-vehicle technologies, technology-enhanced traffic law enforcement, and improvements in pedestrian/cyclist safety. Advances in trauma response and medical treatment have significantly reduced the lethal consequences of many crashes, but further improvements are possible. *If the statistical trend of the past 25 years is applied to the next 25 years, fatalities could be expected to decrease to about 40,300 per year by 2025. However, we are not content with that scenario. So the USDOT has established a “stretch” goal of reducing highway fatalities by 20 percent—to 33,500—by 2008.* This will clearly require even more aggressive and innovative approaches to preventing crashes and reducing their lethal consequences. But if successful, this should put us on a path toward a major milestone: fewer than 25,000 highway fatalities by 2025.

***“As we work together, let us aim for ‘stretch goals’ – goals that push us towards greater achievement than we can now imagine.”***

**Secretary Rodney Slater**  
U.S. Department of Transportation

The goals and policies we set today will be pivotal for transportation safety over the next 25 years. The high marks we set today for the next quarter century will hopefully propel our progress beyond what we might otherwise achieve. Along with the goal for a 20 percent reduction in highway fatalities, the USDOT has set “stretch” goals for an 80 percent reduction in aviation fatalities by 2007, and a 50 percent reduction in motor carrier-related fatalities by 2010.

FAA’s “Safer Skies” initiative is focusing on six key causal factors that contribute to the majority of incidents and crashes: controlled flight into terrain, loss of control, uncontrolled

engine failure, runway incursions, approaches and landings, and weather. The FAA is working in partnership with the airline industry, pilots, technicians, and air traffic controllers to use improved forecasting and new communication technology to detect severe weather sooner.

In motor carrier safety, heightened public attention combined with new legislative mandates will be the basis for improvement—expanding safety regulatory and enforcement programs, coupled with technological innovations and proactive approaches by industry and government to raise safety program quality and effectiveness by all motor carrier operations.

In October 2000, President Clinton signed into law the “Department of Transportation and Related Agencies Appropriations Act, 2000.” This Act provides critical transportation safety funding and contains a provision that will help set a national impaired driving standard at 0.08 Blood Alcohol Content, thereby reducing drunk driving on the nation’s roads and saving lives.

Railroad crossing crashes and fatalities declined dramatically since 1975, and today, the number of fatalities has been reduced by more than half. A significant factor contributing to this decline has been the forging of strong partnerships among rail labor, management, suppliers, state rail safety agencies, and other rail stakeholders. These partners impact rulemaking through the Rail Safety Advisory Committee and the only collaborative safety initiatives on every major railroad, called the Safety Assurance Compliance Program. These efforts have made 1993-1999 the safest seven years in railroad history. These partnerships, together with improved technology, education, and enforcement, can continue increasing safety in the future. Railroad worker and passenger fatalities and injuries are also expected to decline steadily in the next 25 years as a result of widespread use of Positive Train Control (PTC) and other Advanced Train Control Systems, improved locomotive and passenger car safety standards, and improvements in human factors. However, as train movements increase, and development and urbanization spreads along railroad tracks, the incidence of trespassing may increase, along with a corresponding rise in trespasser fatalities.

Fatalities associated with maritime operations have dropped nearly 50 percent since 1975, due in large part to improvements in recreational boating safety and the U.S. Coast Guard’s marine safety programs. Improvements resulted from implementation of the Federal Boat Safety Act of 1971, which drove new regulations affecting both boat manufacturers and boat operators. The U.S. Coast Guard has partnered with States to conduct boater safety and education programs. The states have implemented their own boating safety programs with the help of federal grant funding, and commercial marine operations have been enhanced through Port State Control policies that focus on foreign vessels operating in U.S. ports—covering the design and maintenance of ships, as well as the capabilities and qualifications of their crews. An aggressive program to ensure that all foreign flag passenger vessels operating from U.S. ports comply with all applicable international and U.S. standards has resulted in no passenger deaths since 1984, and the death rate involving the U.S. domestic passenger vessel fleet continues to decline.

In the future, increased global trade will result in ships that are larger and faster, and which carry more cargo. Increased emphasis will be placed on changes in ship design and engineering standards to improve the structural safety, fire protection, and general safety of vessels. Additional improvements in human performance will follow the introduction of advanced technological, organizational management, and work environment products and practices.

*“Secretary Rodney Slater has not only tried to get more money for the nation’s roads, bridges, airports, rail, and mass transit – he has also tried to humanize the face of transportation and save lives.”*

**William J. Clinton**  
President of United States  
October 23, 2000

### FAA and NASA: Working Together on Aviation Vision and Goals

On October 9, 1998, FAA Administrator Jane Garvey and NASA Administrator Daniel Goldin signed a formal agreement establishing a partnership between their agencies with the objectives of defining and achieving specific goals in aviation and future space transportation. This agreement, built on a long history of FAA-NASA joint efforts and cooperation, will provide the leadership needed to define, develop, and deploy the research and technology necessary for the nation's aviation system to meet the difficult challenges of the coming decades.

Looking into the future, NASA and FAA are working to achieve long-term goals in these critical areas:

1. Reduce the aircraft accident rate by a factor of 5 by 2010, and by a factor of 10 by 2025.
2. Reduce CO<sub>2</sub> emissions of future aircraft by 25 percent by 2010, 50 percent by 2025, and possibly totally by 2030 to 2040; reduce NO<sub>x</sub> emissions of future aircraft by a factor of 3 by 2010, 5 by 2025, and completely by 2030 to 2040.
3. Reduce the perceived noise levels of future aircraft by 50 percent (10 dB) from today's subsonic aircraft by 2010, and 75 percent (20 dB) by 2025.
4. While maintaining safety, triple the aviation system throughput, in all weather conditions, by 2010.
5. Reduce the cost of air travel by 25 percent by 2010 and by 50 percent by 2025.
6. Reduce travel time to the Far East and Europe by 50 percent by 2025 and do so at today's subsonic ticket prices.
7. Invigorate the general aviation industry, delivering 10,000 aircraft annually by 2010 and 20,000 aircraft annually by 2025.
8. Provide next generation design tools and experimental aircraft to increase design confidence, and cut the development cycle time for aircraft by 50 percent.
9. Reduce the payload cost to low-Earth orbit by an order of magnitude, from \$10,000 to \$1,000 per pound, by 2010, and by an additional order of magnitude from thousands to hundreds of dollars per pound by 2025.
10. Reduce the cost of interorbital transfer by an order of magnitude by 2015, and reduce travel time for planetary missions by a factor of two by 2015, and by an order of magnitude by 2025.

Source: National Aeronautics and Space Administration, *Roadmaps to the Future — Version 1.0*, available at <http://www.nasa.gov/> as of Dec. 15, 2000.

Under Secretary Rodney Slater's leadership, the USDOT developed a bold and comprehensive plan to modernize our nation's Marine Transportation System (MTS). He led an MTS Task Force, which was a highly collaborative effort of federal, state, local, and private sector stakeholders, to develop a vision for the future, define the critical issues facing the industry, and implement a course of action. Safety remains MTS Task Force's most critical goal and will guide our action plans to improve vessel operations and better manage our marine infrastructure.

Technology, innovation, and leadership may well be the keys to major safety advances in the future. In particular, widespread deployment of collision-avoidance technologies and mitigation strategies will be necessary to achieve the dramatic reductions in deaths and injuries that we seek.

In March 1999, the USDOT held the first-ever National Transportation Safety Conference where we identified the top 10 issues that would lead to the creation of a National Safety Action Plan. These action plans were held together by the concept that "Safety is a promise we make and keep together."

1. Promote and require use of safety equipment in all transportation modes.
2. Promote a culture of safety for all transportation modes and the population.
3. Increase research of performance factors across all transportation modes.
4. Adopt a Federal uniform law of .08 percent blood alcohol concentration for drivers and a zero tolerance level for truckers.
5. Increase funding to support enforcement of existing transportation laws and regulations.
6. Maximize existing safety partnerships.
7. Do a better job of data collection and reporting across all jurisdictions.
8. Implement fatigue management practices.
9. Increase use of technology to improve safety in all transportation modes.
10. Improve international safety cooperation.

Moving forward from this conference, we have made progress. In October 2000, President Clinton signed into law a national impaired driving standard of 0.08 Blood Alcohol Concentration. This will reduce drunk driving on the nation's roads and save lives. We have taken steps to improve transportation safety data for strategic and operational decision, to develop and use advanced safety technologies, and to fund the enforcement of transportation-related laws and regulations.

*"We have pursued a new strategy for prosperity—fiscal discipline to cut interest rates and spur growth; investments in education and skills, in science and technology and transportation, to prepare our people for the new economy; and new markets for American products and American workers."*

William J. Clinton  
President of the United States  
January 27, 1998

## The Environment

The future of the environment and the course of environmental protection are inextricably linked by a variety of factors and events. These include the rate of growth in the population and the economy, the use of and alternatives to fossil fuels, the nature of land use development patterns, and the application of technology and other factors that could help limit the negative impact of transportation on the environment.

Under the leadership of Vice President Gore, the Livable Communities Initiative was developed to ensure an improved quality of life and strong local economies by preserving open spaces, enhancing air and water quality, securing safe streets, and developing places where we work, but spend less time in

traffic and more time with families, friends, and neighbors. In June 2000, First Lady Hillary Rodham Clinton and Secretary Rodney Slater designated 16 National Millennium Trails that connect our nation's landscape, heritage, and culture and demonstrate our national commitment to improving the quality of life for all Americans. Another initiative by President Clinton addresses findings that show the burdens of a polluted environment are borne disproportionately by members of minority and low-income communities. The initiative, known as Environmental Justice, advocates policies that will either cease, reduce, or evenly distribute such problems. Executive Order 12898 directs federal agencies to initiate procedures and actions that make environmental justice part of their basic mission. In 1997, the USDOT issued guidance to incorporate the principles of environmental justice throughout its programs, policies, and activities.

It will become increasingly challenging to balance the need for greater mobility with the needs of the environment. Growing tradeoffs among competing objectives make it more difficult, but not impossible, to develop new transportation facilities as costs of mitigation increase. Creative management of transportation systems to reduce congestion will become increasingly important.

In the mid-1970s, transportation agencies were beginning to develop tools for assessing the environmental impacts of proposed transportation activities, following enactment of the National Environmental Policy Act in 1969. Other environmental statutes passed in the 1970s addressed particular resources. Over time, more sophisticated tools were developed to address environmental considerations, leading to a recent emphasis on improved processes and outcomes.

In 1975, air pollution posed a serious public health threat that was capturing the public's attention. In that year, unleaded gasoline was introduced for use in automobiles equipped with catalytic converters, and emissions standards for motor vehicles were becoming more stringent in general. Transportation sources produced 85 million tons of carbon monoxide (CO), 9 million tons of nitrogen oxide (NO<sub>x</sub>), and 11 million tons of volatile organic compounds (VOC).

*Trends and Choices* forecast significant reductions in these pollutants by 1990 as mandated by the Clean Air Act (CAA) of 1970—CO declining from 85 to 27 million tons, NO<sub>x</sub> declining from just over 9 million tons to just under 9 million tons, and VOC declining

by more than half from 11 to just over 4 million tons. In fact, all three declined by 1990, but only NO<sub>x</sub> declined by as much as Secretary Coleman's forecast. CO emissions dropped not by 68 percent but by a more modest 38 percent; VOC fell not by 61 percent but by 35 percent. Still, in view of the rapid growth in vehicle usage for both passengers and freight over this period, these changes reflect dramatic improvements in emissions and, therefore, air quality. The reduction in lead emissions, however, was most extraordinary—registering a decline of more than 99 percent by 1990. Major amendments to the CAA were enacted in 1977 and 1990. Emissions in all of these areas continued declining through 2000.

**Since 1993, highway emissions declined by almost 15 percent – from 74.4 million tons to 63.7 million tons in 1999.**

Clearly, this is not enough. Today, 39 percent of the U.S. population lives in a “nonattainment” area—not meeting National Ambient Air Quality Standards—for one or more of six criteria pollutants. Ground-level ozone, in particular, remains an important problem for about 90 percent of people in these areas. Further advances can be achieved through greater choices in transportation, reformulated fuels, or greater capture of pollutants. But projected growth in the population and the economy, along with the associated increases in travel and shipping, might easily offset these kinds of technological gains. And the use of fossil fuels or internal combustion engines present powerful constraints on the amount of improvement that can be

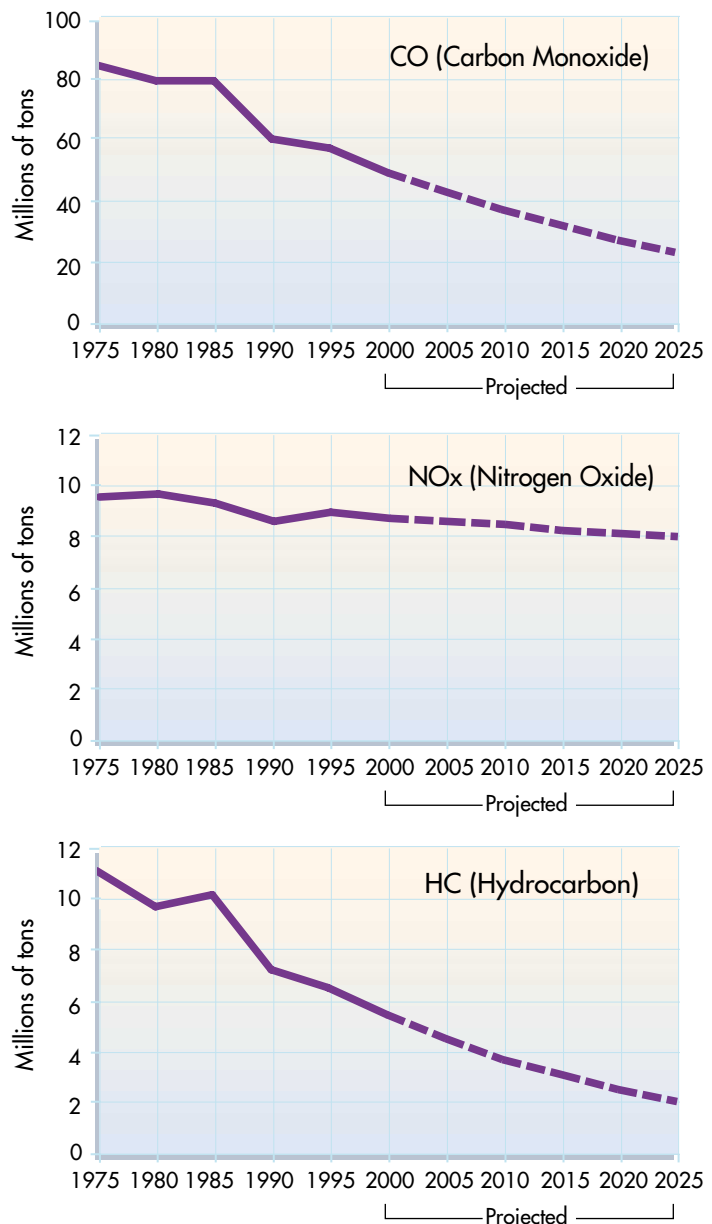
made. The key will be in the development and widespread deployment of alternative energy storage systems, including fuel cells, batteries, hybrid vehicles, regenerative braking, or even flywheels. With breakthroughs in one or more of these areas, we can expect a big decline or even the virtual elimination of vehicle emissions.

Emissions from airports and aircraft remain a concern, and in recent years, we have promoted strategies to reduce these emissions. International standards for cleaner aircraft engines have been developed, and today the current Stage 3 standard, fully implemented in the United States by 2000, has resulted in the quietest aircraft fleet in U.S. history. New Stage 4 aircraft will result in even quieter and cleaner aircraft by 2025. Increased use of cleaner ground support equipment and other steps to reduce airport-related emissions are likely to be in place.

An emerging issue only beginning to be discussed by the public in 1975 was the potential for global climate change resulting from the buildup of greenhouse gases in the atmosphere. One of the most important of these greenhouse gases is carbon dioxide, and transportation is a major source of this. In 1975, transportation produced 350 million metric tons of carbon dioxide (CO<sub>2</sub>) emissions, and the atmosphere carried 330 parts per million CO<sub>2</sub> by volume. Today, transportation produces nearly 500 million metric tons of CO<sub>2</sub> per year, and atmospheric loading is estimated to be about 370 parts per million—1.3 times pre-industrial levels. Scientists propose that the changing global climate may result in further population shifts due to shoreline flooding, changes in agricultural patterns, increased intensity in weather-related disasters (e.g., hurricanes, tornadoes), and direct impacts on transportation infrastructure. The Clinton-Gore Administration has consistently supported strong environmental strategies to mitigate global warming. The USDOT is committed to mitigating the unwanted side effects of transportation-related emissions and established the Center for Climate Change and Environmental Forecasting to identify and promote transportation strategies to reduce greenhouse gas emissions.

Water pollution was not featured as a major problem in *Trends and Choices*, but the 1970s brought a series of high-profile oil spills that focused international attention. In response, regulations were developed in the 1970s and 1980s to address vessel design, construction,

**Emissions from Transportation Sources: 1975-2025**



operations, maintenance, and manning, as well as many corresponding controls for the shoreside facilities that transferred oil to and from these ships and barges. Then, in 1989, the *Exxon Valdez* spilled a record 11 million gallons of oil in Valdez, Alaska. As a result, the Oil Pollution Act of 1990 brought about some of the most widespread changes in petroleum shipping to date, aimed especially at reducing the risk of catastrophic spills. This included an upgraded liability and compensation regime to encourage preventive measures by vessel owners and operators.

Although the total number of spills has remained relatively constant, the total amount of oil spilled into U.S. waters has fluctuated significantly from year to year as a result of a small number of very large spills. But large spills clearly are becoming less common and smaller spills are being controlled as well. The future will depend very much on what happens to motor vehicles over the next 25 years, because transportation is the major user of oil, and U.S. production can supply only about half of all U.S. oil consumption. A continuing flow of oil imports will present continuing risks of spillage. A dramatic change in automobile design, on the other hand, could break the pattern of both U.S. reliance on foreign oil and the associated pollution risks of moving that oil.

**During the past eight years, the USDOT partnered with the shipping industry to develop prevention and response standards that reduced maritime oil spill from 5.3 gallons per million gallons shipped in 1993 to 2.7 in 1999.**

The Clinton-Gore Administration's aggressive goals to speed innovations in environmental technologies will increase vehicle fuel economy, reduce fuel use, improve safety, and lead to greater U.S. energy independence. The Partnership for a New Generation of Vehicles program, a public-private endeavor, has made revolutionary technology breakthroughs for automobiles and light trucks that will make our economy more energy independent and help meet such environmental challenges as global warming.

The advent of increased environmental awareness and legislative action in the early 1970s paved the way for measures to prevent water contamination from other transportation-related sources, such as salt and other chemicals used to deice roads and runways. These actions included the Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977. With the expected increase in number of vehicles, the improper disposal of used motor oil may increase unless new vehicle technologies that do not require the use of motor oil are developed. There is a need for proper design of transportation infrastructure to reduce pollution from runoff from highways and airports. Use of new materials and sensor technologies can prevent leakage from oil storage tanks. The use of nanotechnology may provide materials for road surfacing that will prevent ice formation on the roads without the use of salts. Some of these options may be expensive to deploy, but if we are to achieve long-term sustainability, they may become our only options. Additionally, when we consider the societal and environmental costs of leaving these concerns unchecked, we may conclude that the mitigation costs are well within reason.

Wetlands—an important component of our complex ecological systems—came under increasing pressure from agricultural activities, urbanization, and transportation infrastructure development during the 1960s and 1970s, but were only just emerging as a major issue in 1975. At that time, wetland loss was estimated at approximately 450,000 acres per year, primarily due to agricultural activities. As a result of increased emphasis on preserving our environment, wetland loss has been reduced to 50,000 acres per

**Striving to lessen noise pollution from aircraft, the USDOT worked with the airline industry and achieved remarkable results. In 1993, 2.1 million Americans were exposed to significant aircraft noise. By 1999, this number had fallen to 680,000.**

year, and less than 10 percent of this is estimated to be from highway construction activities. Today, wetlands are being restored as we work toward the national goal of a net gain in wetlands. In 1996, FHWA began nationwide monitoring of annual wetland loss and gain for the Federal-aid highway program. The data collected show that across the country the Federal-aid highway program has achieved a 150 percent gain in wetland acreage (i.e., 2.5 acres of wetlands gained for every acre of loss). The Federal-aid highway program has produced a total net gain of 11,628 acres of wetlands nationwide since 1996. It will be important to improve our conservation of finite resources such as wetlands and other habitats, cultural and natural resources, and green spaces as transportation systems are planned and implemented.

The recent emphasis on managing watersheds and conserving groups of species and ecosystems is likely to continue as we better understand the ecosystem processes that govern environmental quality. The challenge of reducing transportation pathways for the spread of invasive alien species is likely to continue into the next 25 years.

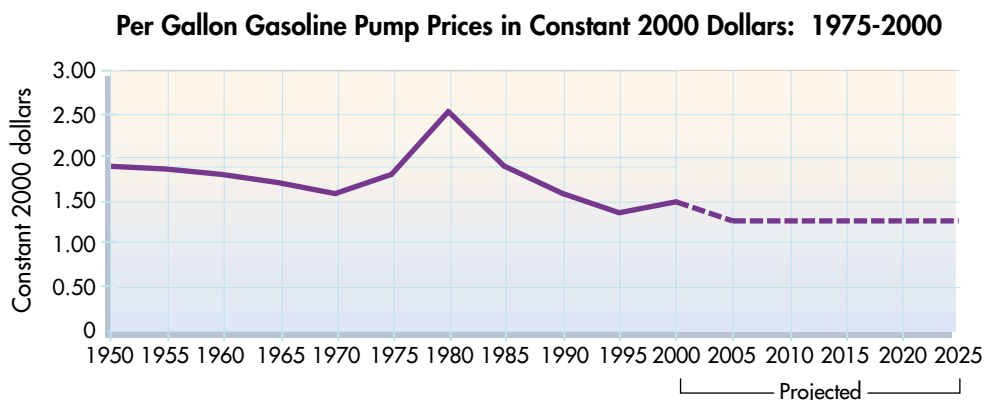
An unintended consequence of transportation is noise pollution. Today, highway and aircraft noise are considered major environmental problems, and with the projected growth in highway and air travel by 2025, there is a need to further reduce vehicle noise. Although noise was considered in *Trends and Choices*, the only observation made about the future suggested that with the advent of quieter aircraft, the number of people exposed to aviation noise would be reduced. The impact of highway noise has been mitigated over the past 25 years through development of quieter engines, improved noise mufflers in vehicles, and construction of noise barriers along major highways. The Aircraft Noise and Capacity Act of 1990 made the quieter Stage 3 aircraft mandatory and older Stage 2 aircraft were fitted with “hush kits” to meet noise-reduction requirements. Stage 4 aircraft will further reduce the impact of aviation noise and quieter aircraft should make up much, if not all, of the fleet in place in 2025. International cooperation in development of noise standards will continue to be important as new noise standards are developed due to growth in passenger travel and freight movements.

A major challenge for the future will be managing growth so that we retain our economic and environmental viability. Improved linkages between transportation and land-use planning will be needed to achieve a more sustainable environment. Dispersed, auto- and truck-dependent development patterns, often referred to as urban sprawl, can increase costs of providing community services and increase congestion, pollution, and consumption of natural resources. Land-use patterns that support a range of transportation choices—communities that encourage use of transit, walking, and bicycling—can begin to address these concerns, but will take many years to develop. Similarly, steps to increase efficiencies in and reduce environmental impacts of freight movement are also needed. By 2025, many of the environmental issues and problems are likely to be similar to those of today’s world, largely because any changes or advances that have a substantial positive impact on the environment take a long time to produce results. We expect water quality and air and noise pollution to continue to improve due largely to enhanced technology (e.g., advances in vehicles, use of nanotechnology, and implementation of ITS), shifts in energy sources and modes of transportation, and reductions in pollutant runoff.

We will need to continue to minimize air, water, and noise pollution. This will require enhanced technology (e.g., advances in vehicles and fuels and implementation of ITS), shifts in modes of transportation, and better means of avoiding environmental impacts (e.g., advancing designs that minimize pollution from runoff). Identifying financing for our environmental efforts will also be a major challenge. There will be a greater emphasis on options that reduce the demand for transportation, such as telecommuting, electronic communications, and alternative work schedules coupled with efforts to further reduce pollution and energy consumption. Other options will include peak pricing and various user fees to positively impact congestion and environmental concerns.

# Energy

In 1975, the United States consumed almost one-third (29 percent) of the world's petroleum production [USDOT BTS 1999]. Transportation represented a little over half (54.8 percent) of that consumption, but the United States was producing nearly two-thirds of its petroleum needs. *Trends and Choices*—written at a time of rising fuel prices—projected a slight (2 percent) decline in transportation energy usage by 1990, generally assuming that gains in fleet energy efficiency and changes in travel behavior would offset increases in travel and freight shipping.



By 1990, while passenger travel was nearly as predicted (within 2 percent) and freight transportation was actually much lower than predicted, energy usage by the transportation sector had risen by 48 percent. While the Corporate Average Fuel Economy (CAFE) standards improved the fuel efficiency of highway vehicles—especially passenger vehicles—in the 1970s and early 1980s, these improvements began to level off by the late 1980s. Fuel prices had moderated, and consumers continued to use the automobile as the predominant choice for personal transportation. The average fuel economy of passenger cars hovered at 21.7 miles per gallon while the standard mandated by the Energy Policy and Conservation Act of 1975 was 27.5 miles per gallon by 1985. Since that time, new energy efficient technologies have been applied, for the most part, to enable owners to drive larger, more powerful vehicles, rather than reduce the amount of fuel used.

The trend of the 1990s is an extension of the trend of the late 1980s. With no changes being made to the CAFE regulations, and with a lower standard for passenger trucks than cars, ownership of light duty trucks, especially SUVs, began to soar. As a result, the energy efficiency of the U.S. highway vehicle fleet has begun to decline, while total vehicle-miles traveled continues to grow (around 2 percent per year).

Technology will probably be the single, most important factor in where we go from here. Regardless of the energy source, transportation will still require energy. If current trends are projected forward, energy use is likely to be 45 percent greater by 2025 than today, or depending on technologies that are deployed, increases may be offset by gains in technology. For example, electric motors are about twice as efficient as internal combustion engines in converting energy into work. They may be powered by batteries, fuel cells, solar panels, flywheels, or any of a variety of energy storage technologies. In addition, they will take advantage of lightweight materials and low-carbon fuel. Their widespread use could clearly reverse the long-term increases in energy use by transportation. Hybrid engines that use a combination of conventional internal combustion engines and battery-powered electric

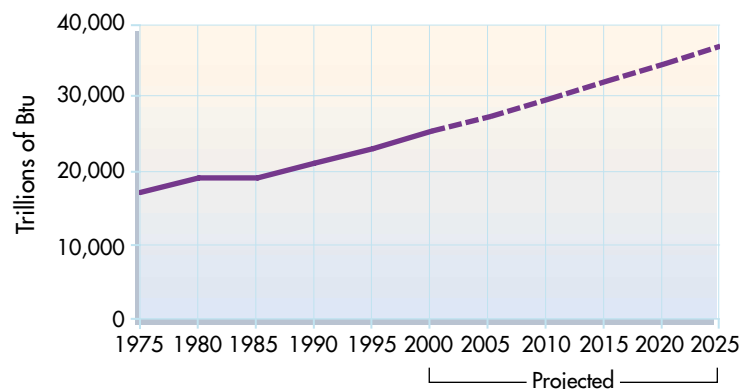
motors have already been introduced to the market. Honda's Insight gasoline-electric hybrid reportedly can achieve 70 mpg on the highway and 65 mpg in combined city /highway driving [Insight]. Perhaps just as importantly, most of these technologies would alter our dependence on oil—with all of the associated environmental and national security implications.

Two partnership programs initiated by the Clinton-Gore Administration, the Partnership for a New Generation of Vehicles program and the 21st Century Truck Initiative, are making significant progress in developing vehicles with low emissions and exceptional fuel efficiency. Today, as part of this federal government / U.S. auto industry partnership, DaimlerChrysler, Ford, and General Motors would be marketing hybrid vehicles that combine a gasoline or diesel-powered engine with an electric motors. Some models are capable of obtaining up to 80 miles per gallon on the highway. Environmental pressures from oil consumption and concerns about oil supply will continue to drive development of alternatives. Public acceptance of new technologies will be key. Public policy and public-private sector collaboration that facilitates the deployment of those technologies will be the major challenge for government agencies. With the right alignment of policies to stimulate the availability of highly efficient vehicles, with full utility and performance, and at reasonable costs (e.g. hybrid-electrics), transportation energy use would grow at a diminishing rate.

By the year 2025, transportation energy use is projected to rise from 25 trillion Btu per year to nearly 37 trillion Btu. Over the next quarter century, transportation energy growth will continue to be dominated by the burning of gasoline and diesel fuels.

New powertrain designs, such as hybrid electric and fuel cells, will become more common. However, these new vehicle designs will be introduced slowly into the fleet over the next 10 years, and it will take several years before their sales volumes comprise a significant portion of new vehicle sales. Because it will take nearly a decade for such vehicles to make up a significant portion of the total U.S. vehicle fleet, their effect on transportation energy use may only begin to make an impact by 2025. By then, estimates are that vehicles powered by advanced technology powertrains will slightly exceed 50 percent of new car sales. Alternative policies such as tax incentives will encourage buyers to purchase these new vehicles.

**Btu Used by Transportation Sources: 1975-2025**



## Globalization

The trend toward globalization was beginning to take shape when *Trends and Choices* was written. The leader in this phenomenon was the automobile industry. During that period, there was a high demand for fuel-efficient Japanese and European cars due to the energy crisis, and in 1975, 18 percent of the cars sold in the United States were imported. At that time, American automakers did not have any manufacturing facilities abroad. But soon, General Motors acquired an ownership stake in the Japanese manufacturing company Isuzu, and in 1978, the first foreign car was produced in the United States by Volkswagen. Since then, the increasing trend toward cross-border ownership and manufacturing facilities has led to intense consolidation and competition within the global auto manufacturing industry. Today,

General Motors has manufacturing facilities in 50 countries, and Ford Motor Company has such facilities in 30 countries outside the United States. Similarly, there are numerous foreign manufacturers now operating in the United States.

Advances in communication and transportation technologies have been major forces allowing for the rapid growth in globalization and economic integration worldwide. Lower transportation costs and higher levels of service and speed have contributed to widely dispersed production and distribution facilities managed by firms that are truly international in scope.

The trend toward globalization is also highlighted by the increase in international air travel—both leisure- and business-related. This has heightened our sensitivity to the safety and security of passengers traveling across the globe and different aviation systems. Under the Clinton-Gore Administration, the United States signed 52 open skies agreements with countries around the world, extending the international reach of the nation's aviation system and making it truly global. These agreements remove all restrictions on airline service and increase competition and service. The FAA has initiated regional safety efforts, such as Safe Skies for Africa and the Partnership for Safer Skies with Latin America. The International Civil Aviation Organization has started the Universal Safety Oversight and Audit Program to ensure that countries provide adequate safety oversight in areas of personnel licensing, aircraft operations, and airworthiness. At the 1999 International Aviation Conference, held in Chicago, Secretary Rodney Slater announced safety audit requirements for U.S. carrier's code-sharing partners.

The integration of manufacturing facilities around the globe has been associated in many countries with the growing divestment of national firms from government ownership. This trend has important implications for international transportation as well, bringing efficiency and competitive marketing to the forefront as criteria of operating decisions. Supporting this development is the progressive deregulation of transportation, although there are still many restrictions on which carriers can operate and where they can pick up or discharge passengers and cargo. Privatization and deregulation have increased the pressure on airlines and ocean shippers either to merge or to conclude marketing alliances across national boundaries. Advances in computerized reservations, container shipping technology, and on-demand air freight have put a competitive premium on seamless integration of logistic services. Future transportation providers may have major operations in all modes and all regions of the world. We must continue to ensure that such consolidation does not reduce the competitiveness of the transportation industry.

During the next 25 years, the phenomenon of globalization will gain more momentum as more countries become linked by advanced information technologies and financial markets. If the necessary capital and infrastructure investments are not available to the less developed countries, they will not be able to share in the economic benefits of globalization, and they will fall further behind in the world economy. As globalization spreads, average per-capita income of countries around the world will become closer. These changes will also demand a rethinking of the remaining responsibilities of government toward private industries. International transportation will continue to require enforcement of safety codes, environmental standards, fair labor practices, precautions against criminal activity, and antitrust protections. In dealing with globalized firms, the present geographic division of sovereign authority will frequently prove inadequate, and the United States will have to collaborate with other countries to develop a common program.

## Technology

Today, we have indeed reached a stage where we direct our resources toward finding solutions to our problems through technological improvements and enhanced efficiency. A prime example of a technology employed to solve problems and enhance efficiency is the computer chip, which makes automatic braking, fuel injection, pollution control, airbag deployment, and many other in-vehicle systems possible. Embedded computer chips are at the heart of many advancements that will one day become standard equipment on automobiles and trucks, such as driver alertness, perimeter (front, behind, to the side) monitoring, accident avoidance, automatic accident reporting, and automatic vehicle operation systems.

For example, the accuracy of GPS in real-time navigation and tracking is driving the development of several advanced systems across all modes of transportation. By 2025, GPS technologies will proliferate through all modes of transportation, functioning as both a transportation utility and a personal utility—an integral component of vehicles as well as such personal items as cellular phones. GPS will provide the basic infrastructure for a continuing and substantial improvement in the safety and efficiency of our national air space system.

Intelligent Transportation Systems (ITS) are being widely deployed to improve the mobility and safety of our surface transportation systems. Technologies such as ramp meters, electronic surveillance, and signal synchronization and pre-emption; advanced weather and road condition information; computer-aided dispatch systems; commercial vehicle technologies; and a host of infrastructure and vehicle innovations promise to reduce congestion, improve efficiency, and make travel safer. While all of these benefits are expected as we increase the deployment of GPS and ITS, some of the gains may be offset by the expected growth in highway travel by 2025.

The current trend of embedding new technologies into the operations and management of the transportation systems will continue and probably accelerate over the next 25 years. The management of transportation systems will become highly automated and increasingly real-time. Congestion will remain an issue, but advances in communication technologies will allow increased telecommuting options. New technologies will allow for the realtime pricing of transportation facilities to increase efficiency and reduce congestion delays. Information technology will play a prominent role both in shaping future transportation demands and in enabling advanced management and operations of transportation services in an era of constrained expansion of physical infrastructure.

## National Security

In 1975, the United States and the Soviet Union were engaged in a protracted cold war, and the world was split into two major military alliances. In *Trends and Choices*, the authors tested the capacity of the intercity transportation impact for a conventional two-front war in 1990. They concluded that the 1990 national transportation system would have sufficient overall capacity. They reasoned that as the nation's transportation system continues to grow, the requirements of a military emergency become a smaller proportion of the total transportation demand.

In the early 1990s, the Gulf War proved that reasoning to be essentially valid. But the focus on national security has shifted considerably from the view in the 1970s. The Soviet Union collapsed along with the communist bloc, and today every country but one—Cuba—in the Western Hemisphere is a democracy. We now have increasing concerns over terrorism, and regional conflicts are a chronic problem. We also have continuing incidents of illegal

immigration and drug smuggling by sea. Infrastructure security—both physical and technological—is another area of growing national concern, and access to oil—a factor in the Gulf War—continues to present a national security interest for the United States.

Continuing globalization of the world's economies will profoundly affect the national security picture. Globalization tightly couples the economies of different countries and tends to increase the power and influence of the private sector. It also tends to blur political boundaries and stimulate cross-boundary agreements, such as the European Union and the North American Free Trade Agreement (NAFTA). The forces of economic efficiency are likely to further stimulate the formation of such alliances. These forces will likely lead to an increase in the volume of trade and movement of people. In addition, our transportation system will be called on to meet the requirement to provide the just-in-time delivery of goods. This poses significant security challenges for the United States by a myriad of threats such as cyber-terrorism, smuggling of people and illegal drugs, protection of natural resources, and the introduction of weapons of mass destruction.

The maritime environment is particularly challenging with the heavy volume of containerized cargo inherent in the system. The key is in identifying the threats before they can manifest themselves in U.S. cities and waterways. To accomplish this, the USDOT, through the U.S. Coast Guard, will develop a new approach suited to the information age to allow us to conduct a risk assessment of every arriving, departing, transiting, and loitering vessel within a geographic coastal area of responsibility. This maritime goal dovetails with existing or envisioned security and transparency needs for other transportation modes, elevating border and economic security, as called for in President Clinton's National Security Strategy.

By 2025, transportation and computerization together will be the catalysts for continuing expansion of the global economy. International interests, in turn, should continue to grow in importance. Globalization challenges conventional thinking about national interests. As commerce grows in importance, so, too, will transportation; however, this will also increase our vulnerability to security threats. Policy direction will, therefore, be guided, by security considerations.

## Policy

Today, a little over seven years after passage of the Government Performance and Results Act of 1993 (GPRA), the challenge to manage our programs with quantitative information that is reliable, accurate, timely, and relevant, is even greater. In keeping with this effort to streamline government, Vice President Gore's 1993 National Partnership on Reinvention moved the federal government to be more accountable to the public and not restrained by rules and regulations that can hamper federal agencies in carrying out their missions.

The USDOT was already poised for implementing GPRA, in part because of the visionary work of our predecessors who, like Secretary Coleman, laid out 10 principles encompassing the policy objectives of the time, addressing government's relationship with the private sector, international transportation concerns, how transportation can contribute to an enhanced quality of life, maintaining multimodal diversity and competition, and the role of the federal government. Many of the goals articulated then have since been met. But, again, we aren't stopping to merely recount our successes. We know we have much to do to improve the transportation system, to make it as safe as it can be; to finish the job of making it accessible to everyone; to increase its capacity to support a rapidly expanding economy; to protect and enhance communities and the natural environment; and to make our transportation system and the nation secure.

The Federal Highway Administration has been a leader in the application of concrete, asphalt, and steel. Administrator Slater made it a top priority to make the agency about more than concrete, asphalt, and steel—making it about people. Innovations included touring thousands of miles to meet with state and local community leaders to better respond to their highway transportation needs. This resulted in building bridges to carry new ideas and to help transform both federal and state DOTs. He also called for innovation in the way we paid for surface transportation. This resulted in the programs of innovative finance that have become a standard, adding billions to transportation infrastructure needs every year. He also recognized the need for expanded uses of research and technology. As a result, we have introduced many new technologies that have made our transportation system safer and more efficient.

As we take stock of the challenges we face, the USDOT has embraced a decisionmaking process that will ensure the public's interests are served, and that the public is involved in the process. This new process began with two plans that were subsequently named "best in government" by Congress—the Department's first Strategic Plan followed by the Department's first annual Performance Plan. In successive steps, we identified the outcomes that the public cares about, set goals to achieve those outcomes, developed our programs and budgets to deliver on our commitments, then measured our performance against our goals. Not all goals were met—to do so would indicate that we had made them too easy to achieve. Consequently, even when we fell short of the mark, we achieved many improvements in safety, mobility, economic growth, the human and natural environment, and national security.

The management of the vast transportation enterprise needs data: to monitor its performance and the performance of elements it affects to see if things are getting better, to monitor its environment, to plan for future transportation, and for command and control. But a particular effort needs to be made on behalf of decisionmakers so they can determine the state of the system, directions of change, and the costs involved in intervening to make things better.

A quickened pace that is driven by technology makes prediction a risky business. Yet, in some sense, we must do it. It is better to move with a direction in mind. This report also poses a challenge to its readers to debate what we have written and improve on the forecasts. Perhaps even in a few years we will have a brand new picture of the year 2025. But as Karl Pearson—considered the father of modern statistics—said, *"No scientific investigation is final; it merely represents the most probable conclusion that can be drawn from the data at the disposal of the writer. A wider range of facts, or more refined analysis, experiment, and observation will lead to new formulas and new theories. This is the essence of scientific progress."*

*The Changing Face of Transportation* is a part of our foundation. Its companion report—*Policy Architecture: A Framework for Transportation Decision Making in the 21<sup>st</sup> Century*—is our blueprint for the process of building a transportation system that gives the people of America the ability to live their lives to the fullest. Together, these documents are aimed at improving our ability to formulate good decisions, making the transportation system better serve the needs of the American people, and involving everyone in the process. They will help demonstrate a simple truth: that transportation truly is "the tie that binds."

## Overview of This Report

*The Changing Face of Transportation* provides a historical, perspective, and futuristic look for policymaking. It reviews the major policy milestones of the past quarter century, and the social and economic context for those milestones and looks ahead to 2025. Secretary Slater has challenged us to develop data as a logical foundation for making future policy choices. Some of those choices are apparent already. Undoubtedly, others will emerge as the future unfolds.

This report is organized around six thematic areas:

- Growth, Deregulation, and Intermodalism;
- Safety;
- Globalization;
- People, Energy, and the Environment;
- Technology; and
- National Security.

Within each of these areas, we look at the world in the mid 1970s, the changes that have taken place since then, and the implications of those trends and others for the future of 2005.

A glossary at the end of the report clarifies terms used in the body of the report.

## References

Clinton-Gore Livable Communities website (Clinton-Gore). 2000. Available at <http://www.livablecommunities.gov>, as of September 26, 2000.

Congressional Budget Office (CBO). 2000. *The Budget and Economic Outlook: Fiscal Years 2001-2010*, table 13. Available at <http://www.cbo.gov/>, as of August 30, 2000.

Insight. Honda website. 2000. Available at <http://www.honda2000.com/models/insight/engineering/index.html>, as of September 27, 2000.

U.S. Department of Commerce (USDOC), U.S. Census Bureau (Census). 1999. *Statistical Abstract of the United States*. Washington, DC.

U.S. Department of Justice (USDOJ). 2000. Guidance Concerning Environmental Justice. Available at <http://www.usdoj.gov/enrd/ejguide.html>, as of September 26, 2000.

U.S. Department of Transportation (USDOT). 1977. *National Transportation Trends and Choices (To the Year 2000)*. Washington, DC. 12 January.

U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS). 1999. *National Transportation Statistics 1999*. Washington, DC.

U.S. Department of Transportation (USDOT). 1999. *An Assessment of the U.S. Marine Transportation System: A Report to Congress*.

## Table 1-1 Sources

### Population

**1975 and 1990 actual:** U.S. Department of Commerce, U.S. Census Bureau, *Statistical Abstract of the United States*, table 2, p. 8 (Washington, DC:1999), available at [www.census.gov/statab](http://www.census.gov/statab), as of August 2000.

**1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)*, table II.2, p. 23 (Washington, DC: 1977).

**2000 and 2025:** U.S. Department of Commerce, U.S. Census Bureau, *Annual Projections of the Total Resident Population as of July 1: Middle, Lowest, and Highest, and Zero International Migration Series, 1999 to 2100*, available at [www.census.gov/population/projections/nation/summary/np-t1.txt](http://www.census.gov/population/projections/nation/summary/np-t1.txt), as of September 3, 2000.

### Gross National Product

**1975 and 1990 actual:** U.S. Department of Commerce, U.S. Census Bureau, *Statistical Abstract of the United States*, 1999, table 722, available at [www.census.gov/statab](http://www.census.gov/statab), as of August 2000. Note: 1992 dollars converted to 1975 dollars. **1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)*, table II.2, p. 23 (Washington, DC: 1977).

**2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates based on Congressional Budget Office forecasts to 2010.

### **Gross Domestic Product**

**2000:** U.S. Department of Commerce, Bureau of Economic Analysis, Gross Domestic Product: Second Quarter 2000, BEA news release, available at [www.bea.doc.gov/bea/newsrel/gdp200p.htm](http://www.bea.doc.gov/bea/newsrel/gdp200p.htm), as of August 25, 2000.

**2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.

### **Passenger-Miles**

**1975 and 1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)*, table II.2, p. 23 (Washington, DC: 1977).

**1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, table 1-30, pp. 46-47 (Washington, DC: 1999).

**2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.

### **Licensed Drivers**

**1975 actual and 1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, p. 408 (Washington, DC: 1999).

**1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)*, p. 96 (Washington, DC: 1977). **2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.

### **Vehicles**

**1975 actual and 1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, table 1-9, p. 13 (Washington, DC: 1999).

**1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)*, p. 96 (Washington, DC: 1977).

**2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.

### **Ton-Miles of Freight**

**1975 actual and 1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, table 1-38, p. 61 (Washington, DC: 1999).

**1975 and 1990 ton data:** Army Corps of Engineers, *Waterborne Commerce of the United States, 1998*.

**2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.

**2000 and 2025 ton estimates:** U.S. Department of Transportation, U.S. Coast Guard, personal communication, 2000.

### **Air Pollution**

**1975 actual and 1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, table 1-38, p. 61 (Washington, DC: 1999).

**2000:** U.S. Department of Energy, Environmental Protection Agency, personal communication, 2000.

**2025:** David Greene, Oak Ridge National Laboratory, personal communication, 2000.

### **Fatalities**

**1975:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1994*, (Washington, DC: 1994).

**2000:** U.S. Department of Energy, Environmental Protection Agency, personal communication, 2000.

**2025:** David Greene, Oak Ridge National Laboratory, personal communication, 2000.

### **Energy**

**1975 actual and 1990 actual:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1999*, table 4-38 (Washington, DC: 1999). EPA. *GHG Trends, 1990-98*.

**1990 Coleman forecast:** U.S. Department of Transportation, *National Transportation Trends and Choices (To the Year 2000)* table II.2, p. 23 (Washington, DC: 1977).

**2000 and 2025:** U.S. Department of Transportation, Bureau of Transportation Statistics, unpublished estimates.